

**CITY OF VINELAND
VINELAND, NEW JERSEY**

SPECIFICATIONS

FOR

**PUBLIC WORKS FACILITY BUILDINGS
78 WEST PARK AVENUE**

COV BID # 2026-23

**BID OPENING: TUESDAY, JULY 7, 2026
PREVAILING TIME: 2:00 P.M.**

**DEPARTMENT OF FINANCE
DIVISION OF PURCHASING
640 E WOOD STREET
P.O. BOX 1508
VINELAND, NJ 08362-1508**

**MIGUEL A. MERCADO, QPA
Purchasing Agent
(856) 794-4040 Phone
(856) 405-4605 Facsimile
mmercado@vinelandcity.org**



640 E. WOOD STREET
P.O. BOX 1508
VINELAND, NJ 08362-1508

DEPARTMENT OF FINANCE
DIVISION OF PURCHASING
MIGUEL A. MERCADO, QPA
PURCHASING AGENT

PHONE: (856) 794-4040
FAX: (856) 405-4605

NOTICE TO BIDDERS

Sealed bids will be received by the Purchasing Agent of the City of Vineland on Tuesday, July 7, 2026, at 2:00 p.m. prevailing time in the Purchasing Department, 5th Fl. City Hall, 640 E. Wood Street, Vineland, New Jersey 08360, at which time and place, bids will be opened and read in public for the furnishing of:

COV BID 2026-23 Public Works Facility Buildings (78 West Park Avenue)

Bid must be submitted in **duplicate** and shall be enclosed in an opaque sealed envelope, addressed to "Division of Purchasing, City of Vineland, 640 E. Wood Street, PO Box 1508, Vineland, NJ 08362-1508."

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

You must submit paper documents as your bid package. We cannot accept electronic copies. The documents to be submitted start with the Checklist. **PLEASE DO NOT SUBMIT THE SPECIFICATIONS WITH YOUR BID PACKAGE. All original signatures must be on one document** (Please use [blue](#) ink for the signatures). The duplicate can be a photocopy.

If you have any questions, please contact the Purchasing Agent at the above number or email PurchasingOffice@vinelandcity.org

DO NOT STAPLE DOCUMENTS
NO DOUBLE-SIDED COPIES

CITY OF VINELAND
GENERAL INSTRUCTIONS
(CONSTRUCTION)

I. SUBMISSION OF BIDS

- A. Sealed bids shall be received in accordance with public advertisement as required by law, with a copy of said being attached hereto and made a part of these specifications.
- B. Each bid shall be submitted on the proposal form attached and shall be submitted in a clearly marked sealed envelope addressed to:

If delivered:

**DIVISION OF PURCHASING
640 E. WOOD STREET
5th FLOOR
VINELAND, NJ 08360**

If mailed:

**DIVISION OF PURCHASING
640 E. WOOD Street 5th FL
PO BOX 1508
VINELAND, NJ 08362-1508**

- DO NOT USE PO BOX ON OVERNIGHT DELIVERY SERVICES, i.e. Fed Ex

Bidder's name, address, bid category and due date must appear on the outside of the BID ENVELOPE containing bid.

- C. Sealed bids will be received by the Purchasing Agent or designated representative, at the time and location as stated in the Notice to Bidders, and at such time and place will be publicly opened and read aloud.
- D. It is the bidder's responsibility to see that bids are presented to the Purchasing Agent on the hour **and at the place designated. Bids may be hand delivered or mailed; however, the City disclaims any** responsibility for bids forwarded by regular or express mail. If the bid is sent by express mail service, the designation in sub-section B, above, must also appear on the outside of the express mail envelope. Bids received after the designated time and date will be returned unopened. The City of Vineland shall not be responsible for late postal or overnight delivery, nor shall postmark dates or overnight dates be considered in honoring of bids. The City of Vineland shall not be responsible for bidder's hand delivering bids who arrive late or to the wrong location.
- E. Sealed bids forwarded to the City before the time of opening of bids may be withdrawn upon written application of the bidder who shall be required to produce evidence showing that the individual is or represents the principal or principals involved in the bid. Once bids have been opened, they shall remain firm for a period of sixty (60) calendar days.
- F. All prices and amounts must be written in ink or preferably machine-printed. Bids containing any conditions, omissions, unexplained erasures or alterations, items not called for in the bid proposal form, attachment of additive information not required by the specifications, or irregularities of any kind, may be rejected by the City. Any changes, whiteouts, strikeouts, etc. in the bid must be initialed in ink by the person signing the bid.
- G. Bids will be received only on the bidding forms attached to this specification or a true copy thereof with all notations to be done in ink or typed and signatures must be done in ink. **ONLY ORIGINAL SIGNATURES ON ALL DOCUMENTS WILL BE ACCEPTED. RUBBER STAMPS,**

COMPUTER GENERATED SIGNATURES, COPIER GENERATED SIGNATURES, OR ANY OTHER ARTIFICIAL SIGNATURES SHALL NOT BE ACCEPTABLE AND SHALL BE REASON FOR REJECTION. City of Vineland will not be held responsible for any erroneous pages or pages missing from this bid document if it is obtained from a source other than the Purchasing Department of the City of Vineland. City of Vineland will not be held responsible if bidders (vendors) fail to receive any updates or addenda to the specification, if they haven't contacted the Purchasing Department.

- H. Each bid proposal form must give the full business address, business phone, fax, the contact person of the bidder, and be signed by an authorized representative as follows:
- Bids by partnerships must furnish the full name of all partners and must be signed in the partnership name by one of the members of the partnership or by an authorized representative, followed by the signature and designation of the person signing.
 - Bids by corporations must be signed in the legal name of the corporation, followed by the name of the State in which incorporated and must contain the signature and designation of the president, secretary or other person authorized to bind the corporation in the matter.
 - Bids by sole-proprietorship shall be signed by the proprietor.
 - When requested, satisfactory evidence of the authority of the officer signing shall be furnished.
- I. Bidder should be aware of the following statutes that represent "Truth in Contracting" laws:
- N.J.S.A. 2C:21-34, et seq. governs false claims and representations by bidders. It is a serious crime for the bidder to knowingly submit a false claim and/or knowingly make material misrepresentation.
 - N.J.S.A. 2C:27-10 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.
 - N.J.S.A. 2C:27-11 provides that a bidder commits a crime if said person, directly or indirectly, confers or agrees to confer any benefit not allowed by law to a public servant.
 - Bidder should consult the statutes or legal counsel for further information.
- J. Potential bidders are hereby cautioned that they are bidding at their own risk and that the specifications/bid packages may or may not be complete if the specifications/bid packages were provided by a third party supplier.
- The City shall not be responsible for third party supplied specifications/bid packages
- K. The City reserves the right to reject individual and/or all bids in accordance with law.
- L. Any prospective bidder who wishes to challenge a bid specification shall file such challenge in writing with the Purchasing Agent no less than three (3) business days prior to the opening of the bids. Challenges filed after that time shall be considered void and having no impact on the contracting unit or the award of a contract; N.J.S.A. 40A: 11-13 (e).
- M. Contracts shall be awarded to the lowest responsive and responsible bidder. City Council reserves the right to reject any and all bids and to waive minor discrepancies therein. City Council also reserves the right to split bids, award individual items, or to award groups of items and categories of items.
- N. Questions concerning this bid shall be directed in writing to the Division of Purchasing, Attention: Miguel A. Mercado, Purchasing Agent, either by facsimile at (856) 405-4605 or by email at PurchasingOffice@vinelandcity.org Last day for questions is _____

II. BID SECURITY AND BONDING REQUIREMENTS

The following provisions if indicated by an (X) shall be applicable to this bid and be made part of the bid documents.

☐ A. BID GUARANTEE

Bidder shall submit with the bid a certified check, cashier's check or bid bond in the amount of ten percent (10%) of the total price bid, but not in excess of \$20,000.00, payable to the City.

When submitting a Bid Bond, it shall contain Power of Attorney for full amount of Bid Bond from a surety company authorized to do business in the State of New Jersey and acceptable to the City.

The check or bond of the unsuccessful bidder(s) shall be returned pursuant to N.J.S.A. 40A:11-24a. The check or bond of the bidder to whom the contract is awarded shall be retained until a contract is executed and the required performance bond or other security is submitted.

The check or bond of the successful bidder shall be forfeited if the bidder fails to enter into a contract pursuant to N.J.S.A. 40A:11-21.

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

☐ B. CONSENT OF SURETY

Bidder shall submit with the bid a Certificate (Consent of Surety) with Power of Attorney for full amount of bid price from a Surety Company authorized to do business in the State of New Jersey and acceptable to the City stating that it will provide said bidder with a Performance Bond in the full amount of the bid. This certificate shall be obtained in order to confirm that the bidder to whom the contract is awarded will furnish Performance and Payment Bonds from an acceptable surety company on behalf of said bidder, any or all subcontractors or by each respective subcontractor or by any combination thereof which results in performance security equal to the total amount of the contract, pursuant to N.J.S.A. 40A:11-22.

Failure to submit a consent of surety shall result in rejection of the bid.

☐ C. PERFORMANCE BOND

Successful bidder shall simultaneously with the delivery of the executed contract, submit an executed bond in the amount of one hundred percent (100%) of the acceptable bid as security for the faithful performance of this contract.

The 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 this with the executed contract shall be cause for declaring the contract null and void pursuant to N.J.S.A. 40A:11-22.

☐ D. LABOR AND MATERIAL (PAYMENT) BOND

Bidder shall with the delivery of the performance bond submit an executed payment bond to guarantee payment to laborers and suppliers for the labor and material used in the work performed under the contract.

Failure to submit a labor and material bond with the performance bond shall be cause for declaring the contract null and void.

☐ E. MAINTENANCE BOND

Upon acceptance of the work by the City, the contractor shall submit a maintenance bond (N.J.S.A. 40A:11-16.3) in an amount not to exceed **100%** of the project costs guaranteeing against defective quality of work or materials for the period of:

- ☐ 1 year
- ☐ 2 years

III. INTERPRETATION AND ADDENDA

- A. The bidder understands and agrees that its bid submitted on the basis of the specifications prepared by the City. The bidder accepts the obligation to become familiar with these specifications.
- B. Bidders are expected to examine the specifications and related bid documents with care and observe all their requirements. Ambiguities, errors or omissions noted by bidders should be promptly reported in writing to the Purchasing Agent. Any prospective bidder who wishes to challenge a bid specification shall file such challenges in writing with the contracting agent no less than three business days prior to the opening of the bids. Challenges filed after that time shall be considered void and having no impact on the contracting unit or the award of a contract pursuant to N.J.S.A. 40A:11-13. In the event the bidder fails to notify the City of such ambiguities, errors or omissions, the bidder shall be bound by the requirements of the specifications and the bidder's submitted bid.
- C. No oral interpretation and or clarification of the meaning of the specifications for any goods and services will be made to any bidder. Such request shall be in writing, addressed to the Purchasing Agent. In order to be given consideration, a written request must be received at least ten (10) business days prior to the date fixed for the opening of the bid for goods and services.

All interpretations, clarifications and any supplemental instructions will be in the form of written addenda to the specifications, and will be distributed to all prospective bidders. All addenda so issued shall become part of the specification and bid documents, and shall be acknowledged by the bidder in the bid. The City's interpretations or corrections thereof shall be final.

When issuing addenda, the City shall provide required notice prior to the official receipt of bids to any person who has submitted a bid or who has received a bid package pursuant to N.J.S.A. 40A:11-23c.1.

D. Discrepancies in Bids

- Ditto marks are not considered writing or printing and shall not be used.
- In the event that there is a discrepancy between the unit prices and the extended totals, the unit prices shall prevail. In the event there is an error of the summation of the extended totals, the computation by the City of the extended totals shall govern.

E. Pre-Bid Conference

☐

If stated in the Notice to Bidders:

A Pre-Bid Conference is not required for this bid.

☐

A non-mandatory pre-bid conference for this proposal will be held on _____ at _____. Attendance is not mandatory, but is strongly recommended. Failure to attend does not relieve the bidder of any obligations or requirements. A site visit will immediately follow the pre-bid.

IV. **BRAND NAMES, STANDARDS OF QUALITY AND PERFORMANCE**

- A. Brand names and/or descriptions used in these specifications are to acquaint bidders with the types of goods and services desired and will be used as a standard by which goods and services offered as equivalent will be evaluated.
- B. Variations between the goods and services described and the goods and services offered are to be fully identified and described by the bidder on a separate sheet and submitted with the bid proposal form. Vendor literature WILL NOT suffice in explaining exceptions to these specifications. In the absence of any exceptions by the bidder, it will be presumed and required that the goods and services as described in the bid specification be provided or performed.
- C. It is the responsibility of the bidder to document and/or demonstrate the equivalency of the goods and services offered. The City 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 City harmless from any damages resulting from such infringement.
- E. Only manufactured and farm products of the United States, wherever available, shall be used pursuant to N.J.S.A. 40A:11-18.
- F. The contractor shall guarantee any or all goods and services supplied under these specifications. Defective or inferior goods shall be replaced at the expense of the contractor. The contractor will be responsible for return freight or restocking charges.

V. **INSURANCE AND INDEMNIFICATION**

The insurance documents as listed below shall include but are not limited to the following coverage's. (Where insurance requirements are listed under other sections of these specifications, the higher limits will prevail.)

A. **INSURANCE REQUIREMENTS**

- **Worker's Compensation Insurance**

Workers Compensation insurance shall be maintained in full force during the life of the contract, covering all employees engaged in performance of the contract pursuant to N.J.S.A. 34:15-12(a) and N.J.A.C. 12:235-1.6. Statutory Limit for Workers' Compensation and \$500,000 for Employer's Liability.

- **General Liability Insurance**

General liability insurance shall be provided with limits of not less than \$1,000,000 any one person/any one accident for bodily injury and property damage and \$3,000,000 aggregate, and shall be maintained in full force during the life of the contract.

- **Automobile Liability Insurance**

Automobile liability insurance covering contractor for claims arising from owned, hired and non-owned vehicles with limits of not less than \$1,000,000 any one person / any one accident for bodily injury and property damage, and shall be maintained in full force during the life of the contract.

- **Other Forms of Insurance Required**

B. CERTIFICATES OF THE REQUIRED INSURANCE

Certificates of Insurance for those policies required above shall be submitted with the contract. Such coverage shall be with an insurance company authorized to do business in the State of New Jersey and shall name the City of Vineland as an additional insured.

Self-insured contractors shall submit an affidavit attesting to their self-insured coverage and shall name the City of Vineland as an additional insured.

C. INDEMNIFICATION

Bidder shall indemnify and hold harmless the City of Vineland from all claims, suits or actions, and damages or costs of every name and description to which the City of Vineland may be subjected or put by reason of injury to the person or property of another, or the property of the City of Vineland resulting from negligent acts or omissions on the part of the contractor, the contractor's agents, servants or subcontractors in the delivery of goods and services, or in the performance of the work under the contract.

VI. PRICING INFORMATION FOR PREPARATION OF BIDS

- A. The City of Vineland is exempt from any local, state or federal sales, use or excise tax.
- B. Estimated Quantities (Open-End Contracts): The City has attempted to identify the item(s) and the estimated amounts of each item bid to cover its requirements; however, past experience shows that the amount ordered may be different than that submitted for bidding. The right is reserved to decrease or increase the quantities specified in the specifications pursuant to N.J.A.C. 5:30-11.2 and 11.10. NO MINIMUM PURCHASE IS IMPLIED OR GUARANTEED.
- C. Contractor shall be responsible for obtaining any applicable permits or licenses from any government entity that has jurisdiction to require the same. All bids submitted shall have included this cost.
- D. 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 City. 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.

VII. STATUTORY AND OTHER REQUIREMENTS

The following are mandatory requirements of this bid and contract.

A. MANDATORY AFFIRMATIVE ACTION CERTIFICATION

No firm may be issued a contract unless it complies with the affirmative action provisions of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27-1 et seq. The following information summarizes the full, required regulatory text, which is included as Exhibit A of this bid specification.

1. Goods and Services (including professional services) Contracts

Each contractor shall submit to the public agency, after notification of award but prior to execution of a goods and services contract, one of the following three documents:

- A photocopy of a valid letter that the contractor is operating under an existing Federally approved or sanctioned affirmative action program (good for one year from the date of the letter); or
- A photocopy of a Certificate of Employee Information Report approval, issued in accordance with N.J.A.C. 17:27-4; or

- A photocopy of an Employee Information Report (Form AA 302) provided by the Division and distributed to the public agency to be completed by the contractor in accordance with N.J.A.C. 17:27-4.

2. Maintenance/Construction Contracts

After notification of award, but prior to signing the contract, the contractor shall submit to the public agency compliance officer and the Division of Contract Compliance and Equal Employment Opportunity in Public Contracts (Division) an initial project workforce report (Form AA201) provided to the public agency by the Division for distribution to and completion by the contractor, in accordance with N.J.A.C. 17:27-7.

The contractor shall also submit a copy of the Monthly Project Workforce Report once a month thereafter for the duration of the contract to the Division 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 and/or off-the-job programs for outreach and training of minorities and women.

B. AMERICANS WITH DISABILITIES ACT OF 1990

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

C. STOCKHOLDER DISCLOSURE

N.J.S.A. 52:25-24.2 provides that no corporation, partnership, limited partnership, limited liability corporation, limited liability partnership, Subchapter S corporation or sole proprietorship, 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, partnership, limited partnership, limited liability corporation, limited liability partnership, Subchapter S corporation or sole proprietorship, bidders shall submit a statement setting forth the names and addresses of all stockholders in the corporation or partnership who own (10%) ten percent or more of its stock of any class, or of all individual partners in the partnership who own a ten percent or greater interest therein. The included Statement of ownership shall be completed and attached to the bid proposal. This requirement applies to all forms of corporations and partnerships, including, but not limited to, limited partnerships, limited liability corporations, limited liability partnerships and Subchapter S corporations. Failure to submit a stockholder disclosure document shall result in rejection of the bid.

D. PROOF OF BUSINESS REGISTRATION

N.J.S.A. 52:32-44 requires that each bidder (contractor) submit proof of business registration. Certificate must be submitted prior to award of the contract and the bidder had to have obtained the BRC prior to receipt of bids. A BRC is obtained from the New Jersey 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 the following requirements on contractors and all subcontractors that **knowingly** provide goods or perform services for a contractor fulfilling this contract:

1. The contractor shall provide written notice to its subcontractors and suppliers to submit proof of business registration to the contractor;
2. 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;
3. During the term of this contract, the contractor and its affiliates shall collect and remit, and shall notify all subcontractors and their affiliates that they must collect and remit to the Director, New Jersey Division of Taxation, the use tax due pursuant to the Sales and Use Tax Act, (N.J.S.A. 54:32B-1 et seq.) on all sales of tangible personal property delivered into this State.

A contractor, subcontractor or supplier who fails to provide proof of business registration or provides false business registration information shall be liable to a penalty of \$25 for each day of violation, not to exceed \$50,000 for each business registration not properly provided or maintained under a contract with a contracting agency. Information on the law and its requirements is available by calling (609) 292-1730.

If boxes of the following items are checked, they are mandatory requirements of the bid proposal and contract.

☐ E. 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 N.J. Worker and Community Right to Know Law (N.J.S.A. 34:5A-1 et seq., and N.J.A.C 8:59-2 et seq.). 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.

☐ F. PREVAILING WAGE ACT

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. The contractor shall be required to submit a certified payroll record to the City within ten (10) days of the payment of the 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. 12:60-6.1(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. Bidders are cautioned to take into consideration statutory legal requirements, particularly, the payment of prevailing wages. It is Bidder's sole responsibility for determining the correct labor classification(s) and paying the correct and proper wage and benefits and it is imperative that the Contractor familiarize itself with the current wage and benefit rates before submitting bids based on these specifications. **NOTE: Additional information and current wage rates are available at: http://lwd.state.nj.us/labor/wagehour/wagehour_index.html.**

☐ G. THE PUBLIC WORKS CONTRACTOR REGISTRATION ACT

N.J.S.A. 34:11-56.48 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-subcontractors 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.

The law defines "public works projects" as contracts for "public work" as defined in the Prevailing Wage statute [N.J.S.A. 34:11-56.26(5)]. The term means:

- "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 with a full and accurately completed application form. The form is available online at http://lwd.state.nj.us/labor/wagehour/regperm/pw_cont_reg.html

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

☐ H. **NON-COLLUSION AFFIDAVIT (Not Applicable)**

The Affidavit shall be properly executed and submitted with the bid proposal.

☐ I. **PAY TO PLAY**

Starting in January, 2007, 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.

☐ J. **NJ ONE CALL**

By presenting a bid, contractor declares that he is aware of and, if required, will comply with the requirements of the "Underground Facility Protection Act (Public Law 1994, Chapter 118)" prior to commencing any intended excavation. The telephone number to call is 1-800-272-1000. The successful bidder will be required to show compliance with the requirement by submitting to the appropriate project coordinator the confirmation number obtained from ONE-CALL before any excavation is undertaken.

VIII. METHOD OF CONTRACT AWARD

- A. The length of the contract shall be stated in the technical specifications. Pursuant to requirements of N.J.A.C. 5:30-5.1 et seq., any contract resulting from this bid shall be subject to the availability and appropriation of sufficient funds annually. Please see Section X, Termination of Contract, Sub-section E, for additional information.
- B. If the award is to be made on the basis of a base bid only, it shall be made to that responsible bidder submitting the lowest base bid.
- C. If the award is to be made on the basis of a combination of a base bid with selected options, it shall be made to that responsible bidder submitting the lowest net bid.
- D. The City may also elect to award the contract on the basis of unit prices.
- E. The form of contract shall be submitted by the City to the successful bidder. Terms of the specifications/bid package prevail. Bidder exceptions must be formally accepted by the City.
- F. **Choice of Law:** The agreement with the successful bidder shall be construed in accordance with the laws of the State of New Jersey. In the event of litigation or other legal proceedings commenced to enforce the terms of the agreement, the venue of such litigation shall be the Superior Court of New Jersey, Cumberland County.

IX. CAUSES FOR REJECTING BIDS

Bids may be rejected for any of the following reasons:

- A. All bids pursuant to N.J.S.A. 40A:11-13.2;
- B. If more than one bid is received from an individual, firm or partnership, corporation or association under the same name;
- C. Multiple bids from an agent representing competing bidders;
- D. The bid is inappropriately unbalanced;
- E. The bidder is determined to possess, pursuant to N.J.S.A. 40A:11-4b, Prior Negative Experience; or,
- F. If the successful bidder fails to enter into a contract within 21 days, Sundays and holidays excepted, or as otherwise agreed upon by the parties to the contract. In this case at its option, the City may accept the bid of the next lowest responsible bidder. (N.J.S.A. 40A:11-24b)

X. TERMINATION OF CONTRACT

- A. If, through any cause, the contractor 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 City 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 City of any obligation for balances to the contractor of any sum or sums set forth in the contract. City will pay only for goods and services accepted prior to termination.
- B. Notwithstanding the above, the contractor shall not be relieved of liability to the City for damages sustained by the City by virtue of any breach of the contract by the contractor and the City may withhold any payments to the contractor for the purpose of compensation until such time as the exact amount of the damage due the City from the contractor is determined.
- C. The contractor agrees to indemnify and hold the City harmless from any liability to subcontractors/suppliers concerning payment for work performed or goods supplied arising out of the lawful termination of the contract by the City under this provision.
- D. In case of default by the contractor, the City may procure the goods or services from other sources and hold the contractor responsible for any excess cost.
- E. Continuation of the terms of the contract beyond the fiscal year is contingent on availability of funds in the following year's budget. In the event of unavailability of such funds, the City reserves the right to cancel the contract.
- F. **ACQUISITION, MERGER, SALE AND/OR TRANSFER OF BUSINESS, ETC.**
It is understood by all parties that if, during the life of the contract, the contractor disposes of his/her business concern by acquisition, merger, sale and or/transfer or by any means convey his/her interest(s) to another party, all obligations are transferred to that new party. In this event, the new City(s) will be required to submit all documentation/legal instruments that were required in the original bid/contract. Any change shall be approved by the City.
- G. The contractor will not assign any interest in the contract and shall not transfer any interest in the same without the prior written consent of the City.
- H. The City may terminate the contract for convenience by providing 60 calendar days advanced notice to the contractor.

XI. PAYMENT

- A. No payment will be made unless duly authorized by the City's authorized representative and accompanied by proper documentation. The City is not permitted to pay down payments or deposits on contracts.
- B. Payment will be made in accordance with the City's policy and procedures.

XII. W-9

- A. Bidder shall complete W-9 form and submit to the City of Vineland Division of Purchasing prior to contract award. This form is available at the following link: <http://www.irs.gov/pub/irs-pdf/fw9.pdf?portlet=3>

XIII. Contract Records

As per N.J.A.C. 17:44-2.2 Vendor 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.

XIV. TIME FOR COMPLETION

The Contractor shall achieve substantial completion of all work required under this Contract within **90 calendar days** from the date of the Notice to Proceed. This includes the complete demolition of all structures, removal of debris, and site restoration as specified herein.

Permission for Bidder to Withdraw a Bid Due to a Mistake in Certain Circumstances

(N.J.S.A. 40A:11-23.3)

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

A bidder claiming a mistake under N.J.S.A. 40A:11-23.3 must submit a request for withdrawal, **in writing**, by certified or registered mail to _____ Purchasing Agent, City of Vineland, 640 E. Wood Street, P.O. Box 1508, Vineland, NJ 08361-1508. The bidder must request withdrawal of a bid due to a mistake, as defined by the law, within five business days after the receipt and opening of the bids. Since the bid withdrawal request shall be effective as of the postmark of the certified or registered mailing, _____ Purchasing Agent, may contact all bidders, after bids are opened, to ascertain if any bidders wish to, or already have exercised a request to withdraw their bid pursuant to N.J.S.A. 40A:11-23.3.

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

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

LOWEST BIDDER PREVAILING WAGE CERTIFICATION

In the case of a Bidder making the lowest bid for this contract by at least ten percent (10%) under the amount of the next lowest bidder, they shall be required to certify to the City of Vineland prior to the award of a contract that the prevailing wage rates required pursuant to the Prevailing Wage Act shall be paid in performing the work under the contract. In the event that the Bidder does not provide the certification prior to the award of the contract, the City of Vineland shall award the contract to the next lowest responsible and responsive bidder.

NEW JERSEY ANTI-DISCRIMINATION PROVISIONS
NJ.S.A.10:2-1 ET SEQ.

Pursuant to NJ.S.A. 10:2-1, if awarded a contract, the contractor agrees that:

- A. In the hiring of persons for the performance of work under this contract or any subcontract hereunder, or for the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under this contract, no contractor, nor any person acting on behalf of such contractor or subcontractor, shall, by reason of race, creed, color, national origin, ancestry, marital status, gender identity or expression, affectional or sexual orientation or sex, discriminate against any person who is qualified and available to perform the work to which the employment relates;
- B. No contractor, subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee engaged in the performance of work under this contract or any subcontract hereunder, or engaged in the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under such contract, on account of race, creed, color, national origin, ancestry, marital status, gender identity or expression, affectional or sexual orientation or sex;
- C. There may be deducted from the amount payable to the contractor by the contracting public agency, under this contract, a penalty of \$50.00 for each person for each calendar day during which such person is discriminated against or intimidated in violation of the provisions of the contract; and
- D. This contract may be canceled or terminated by the contracting public agency, and all money due or to become due hereunder may be forfeited, for any violation of this section of the contract occurring after notice to the contractor from the contracting public agency of any prior violation of this section of the contract.

Provisions Concerning Changed Conditions in Construction Contracts (N.J.S.A. 40A:11-16.7)

(1) If the contractor encounters differing site conditions during the progress of the work of the contract, the contractor shall promptly notify the contracting unit in writing of the specific differing site conditions encountered before the site is further disturbed and before any additional work is performed in the impacted area.

(2) Upon receipt of a differing site conditions notice in accordance with paragraph (1) of this subsection, or upon the contracting unit otherwise learning of differing site conditions, the contracting unit shall promptly undertake an investigation to determine whether differing site conditions are present.

(3) If the contracting unit determines different site conditions that may result in additional costs or delays exist, the contracting unit shall provide prompt written notice to the contractor containing directions on how to proceed.

(4) (a) The contracting unit shall make a fair and equitable adjustment to the contract price and contract completion date for increased costs and delays resulting from the agreed upon differing site conditions encountered by the contractor.

(b) If both parties agree that the contracting unit's investigation and directions decrease the contractor's costs or time of performance, the contracting unit shall be entitled to a fair and equitable downward adjustment of the contract price or time of performance.

(c) If the contracting unit determines that there are no differing site conditions present that would result in additional costs or delays, the contracting unit shall so advise the contractor, in writing, and the contractor shall resume performance of the contract, and shall be entitled to pursue a differing site conditions claim against the contracting unit for additional compensation or time attributable to the alleged differing site conditions.

(5) Execution of the contract by the contractor shall constitute a representation that the contractor has visited the site and has become generally familiar with the local conditions under which the work is to be performed.

(6) As used in this subsection, "differing site conditions" mean physical conditions at the contract work site that are subsurface or otherwise concealed and which differ materially from those indicated in the contract documents or are of such an unusual nature that the conditions differ materially from those ordinarily encountered and generally recognized as inherent in the work of the character provided for in the contract.

b. A contract subject to this section shall include the following suspension of work provisions:

(1) The contracting unit shall provide written notice to the contractor in advance of any suspension of work lasting more than 10 calendar days of the performance of all or any portion of the work of the contract.

(2) If the performance of all or any portion of the work of the contract is suspended by the contracting unit for more than 10 calendar days due to no fault of the contractor or as a consequence of an occurrence beyond the contracting unit's control, the contractor shall be entitled to compensation for any resultant delay to the project completion or additional contractor expenses, and to an extension of time, provided that, to the extent feasible, the contractor, within 10 calendar days following the conclusion of the suspension, notifies the contracting unit, in writing, of the nature and extent of the suspension of work. The notice shall include available supporting information, which information may thereafter be supplemented by the contractor as needed and as may be reasonably requested by the contracting unit.

Whenever a work suspension exceeds 60 days, upon seven days' written notice, either party shall have the option to terminate the contract for cause and to be fairly and equitably compensated therefor.

(3) Upon receipt of the contractor's suspension of work notice in accordance with paragraph (2) of this subsection, the contracting unit shall promptly evaluate the contractor's notice and promptly advise the contractor of its determination on how to proceed in writing.

(4) (a) If the contracting unit determines that the contractor is entitled to additional compensation or time, the contracting unit shall make a fair and equitable upward adjustment to the contract price and contract completion date.

(b) If the contracting unit determines that the contractor is not entitled to additional compensation or time, the contractor shall proceed with the performance of the contract work, and shall be entitled to pursue a suspension of work claim against the contracting unit for additional compensation or time attributable to the suspension.

(5) Failure of the contractor to provide timely notice of a suspension of work shall result in a waiver of a claim if the contracting unit can prove by clear and convincing evidence that the lack of notice or delayed notice by the contractor actually prejudiced the contracting unit's ability to adequately investigate and defend against the claim.

c. A contract subject to this section shall include the following change in character of work provisions:

(1) If the contractor believes that a change directive by the contracting unit results in a material change to the contract work, the contractor shall so notify the contracting unit in writing. The contractor shall continue to perform all work on the project that is not the subject of the notice.

(2) Upon receipt of the contractor's change in character notice in accordance with paragraph (1) of this subsection, the contracting unit shall promptly evaluate the contractor's notice and promptly advise the contractor of its determination on how to proceed in writing.

(3) (a) If the contracting unit determines that a change to the contractor's work caused or directed by the contracting unit materially changes the character of any aspect of the contract work, the contracting unit shall make a fair and equitable upward adjustment to the contract price and contract completion date. The basis for any such price adjustment shall be the difference between the cost of performance of the work as planned at the time of contracting and the actual cost of such work as a result of its change in character, or as otherwise mutually agreed upon by the contractor and the contracting unit prior to the contractor performing the subject work.

(b) If the contracting unit determines that the contractor is not entitled to additional compensation or time, the contractor shall continue the performance of all contract work, and shall be entitled to pursue a claim against the contracting unit for additional compensation or time attributable to the alleged material change.

(4) As used in this subsection, "material change" means a character change which increases or decreases the contractor's cost of performing the work, increases or decreases the amount of time by which the contractor completes the work in relation to the contractually required completion date, or both.

d. A contract subject to this section shall include the following change in quantity provisions:

(1) The contracting unit may increase or decrease the quantity of work to be performed by the contractor.

(2) (a) If the quantity of a pay item is cumulatively increased or decreased by 20 percent or less from the bid proposal quantity, the quantity change shall be considered a minor change in quantity.

(b) If the quantity of a pay item is increased or decreased by more than 20 percent from the bid proposal quantity, the quantity change shall be considered a major change in quantity.

(3) For any minor change in quantity, the contracting unit shall make payment for the quantity of the pay item performed at the bid price for the pay item.

(4) (a) For a major increase in quantity, the contracting unit or contractor may request to renegotiate the price for the quantity in excess of 120 percent of the bid proposal quantity. If a mutual agreement cannot be reached on a negotiated price for a major quantity increase, the contracting unit shall pay the actual costs plus an additional 10 percent for overhead and an additional 10 percent for profit, unless otherwise specified in the original bid.

(b) For a major decrease in quantity, the contracting unit or contractor may request to renegotiate the price for the quantity of work performed. If a mutual agreement cannot be reached on a negotiated price for a major quantity decrease, the contracting unit shall pay the actual costs plus an additional 10 percent for overhead and an additional 10 percent for profit, unless otherwise specified in the original bid; provided, however, that the contracting unit shall not make a payment in an amount that exceeds 80 percent of the value of the bid price multiplied by the bid proposal quantity.

(5) As used in this subsection, the term "bid proposal quantity" means the quantity indicated in the bid proposal less the quantities designated in the project plans as "if and where directed."

City of Vineland

Revised Contract Language for BRC Compliance

Goods and Services Contracts (including Purchase Orders)

***Construction Contracts (including Public Works related Purchase Orders)**

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

1. The contractor shall provide written notice to its subcontractors and suppliers to submit proof of business registration to the contractor;
2. Subcontractors through all tiers of a project must provide written notice to their subcontractors and suppliers to submit proof of business registration and subcontractors shall collect such proofs of business registration and maintain them on file;
3. Prior to receipt of final payment from a contracting agency, a contractor must submit to the contracting agency an accurate list of all subcontractors and suppliers or attest that none was used;
4. During the term of this contract, the contractor and its affiliates shall collect and remit and shall notify all subcontractors and their affiliates that they must collect and remit to the Director, New Jersey Division of Taxation, the use tax due pursuant to the Sales and Use Tax Act, (N.J.S.A. 54:32B-1 et seq.) on all sale of tangible personal property delivered into this State.

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

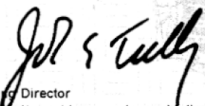
NEW JERSEY BUSINESS REGISTRATION

Pursuant to P.L. 2004, c.57, all consultants (both in-state and out-of-state) must obtain a Business Registration Certificate (BRC) from the New Jersey Department of the Treasury, Division of Revenue prior to conducting business with the NJTPA. A consultant or sub-consultant who fails to submit a copy of a valid BRC in accordance with the statute will be held liable for monetary penalties in accordance with N.J.S.A. 54:49-4.1. Questions regarding how to obtain a BRC can be directed to the New Jersey Division of Revenue at (609) 292-1730. The business registration form (Form NJ-REG) can be found online at:

<http://www.state.nj.us/treasury/revenue/busregcert.shtml> or

<http://www.state.nj.us/treasury/revenue/gettingregistered.shtml>

Sample New Jersey Registration Certificates:

STATE OF NEW JERSEY BUSINESS REGISTRATION CERTIFICATE		DEPARTMENT OF TREASURY/ DIVISION OF REVENUE PO BOX 252 TRENTON, N J 08646-0252
TAXPAYER NAME:	TRADE NAME:	
TAXPAYER IDENTIFICATION#:	SEQUENCE NUMBER:	
ADDRESS:	ISSUANCE DATE:	
EFFECTIVE DATE:		
FORM-BRC(08-01)	This Certificate is NOT assignable or transferable. It must be conspicuously displayed at above address.	

 STATE OF NEW JERSEY BUSINESS REGISTRATION CERTIFICATE	
Taxpayer Name:	TAX REG TEST ACCOUNT
Trade Name:	
Address:	847 ROEBLING AVE TRENTON, NJ 08611
Certificate Number:	1093907
Date of Issuance:	October 14, 2004
For Office Use Only: 20041014112823533	

**THIS PROJECT REQUIRES A CERTIFICATE
FOR PUBLIC WORKS CONTRACTOR REGISTRATION
FOR GENERAL CONTRACTORS AND SUBCONTRACTORS IN
ACCORDANCE WITH PL 1999 C. 238**

For questions or information about PL 1999, C.238, please call Contractor Registration Unit, New Jersey Department of Labor, Division of Wage and Hour Compliance, (609) 292-9464 or email: contreg@dol.state.nj.us

The website is: <http://www.nj.gov/labor/wageandhour/registration-permits/register/publicworksregistration.shtml>

CERTIFICATE MUST BE SUBMITTED TO THE CITY OF VINELAND PURCHASING DEPARTMENT PRIOR TO CONTRACT AWARD. CERTIFICATES MUST ALSO BE SUBMITTED FOR ANY/ALL OF THE COMPANIES/INDIVIDUALS LISTED ON THE SUBCONTRACTORS LIST AS THE PRIME SUBCONTRACTORS (AS REQUIRED BY N.J.S.A. 40A:11-16)

The City of Vineland cannot accept applications. We cannot award a contract if the certificate was not issued to the contractor/subcontractor prior to submission of the bid.

Certificate Number	Expiration Date
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State of New Jersey



Department of Labor
Division of Wage and Hour Compliance

Public Works Contractor Registration Act

Pursuant to Public Law 1999 Chapter 238, the Public Works Contractor Registration Act, this
certificate of registration, for purposes of bidding on and engaging in
public work is issued to

2004

This certificate may not be transferred or assigned
and may be revoked for cause by the Commissioner of Labor



Albert G. Krull

ALBERT G. KRULL, Commissioner
Department of Labor

NON TRANSFERABLE

MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE
N.J.S.A. 10:5-31 et seq. (P.L.1975, c.127) and N.J.A.C. 17:27-1.1 et seq.

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 contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

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

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

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

When hiring or scheduling workers in each construction trade, the contractor or subcontractor agrees to make good faith efforts to employ minority and women workers in each construction trade consistent with the targeted employment goal prescribed by N.J.A.C. 17:27-7.2; provided, however, that the Dept. of LWD, Construction EEO Monitoring Program, may, in its discretion, exempt a contractor or subcontractor from compliance with the good faith procedures prescribed by the following provisions, A, B, and C, as long as the 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 subcontractor as it fulfills its affirmative action obligations under this contract and in accordance with the rules promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et. seq., as supplemented and amended from time to time and the Americans with Disabilities Act. If the contractor or subcontractor is unable to obtain said assurances from the construction trade union at least five business days prior to the commencement of construction work, the contractor or subcontractor agrees to afford equal employment opportunities minority and women workers directly, consistent with this chapter. If the contractor's or subcontractor's prior experience with a construction trade union, regardless of whether the union has provided said assurances, indicates a significant possibility that the trade union will not refer sufficient minority and women workers consistent with affording equal employment opportunities as specified in this chapter, the contractor or subcontractor agrees to be prepared to provide such opportunities to minority and women workers directly, consistent with this chapter, by complying with the hiring or scheduling procedures prescribed under (B) below; and the contractor or subcontractor further agrees to take said action immediately if it determines that the union is not referring minority and women workers consistent with the equal employment opportunity goals set forth in this chapter.

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

- (1) To notify the public agency compliance officer, the Dept. of WD, 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 nondiscrimination standards set forth in this regulation, as well as with applicable Federal and State court decisions;
- (6) To adhere to the following procedure when minority and women workers apply or are referred to the contractor or subcontractor:
 - (i) The contractor or subcontractor shall interview the referred minority or women worker.
 - (ii) If said individuals have never previously received any document or certification signifying a level of qualification lower than that required in order to perform the work of the construction trade, the contractor or subcontractor shall in good faith determine the qualifications of such individuals. The contractor or subcontractor shall hire or schedule those individuals who satisfy appropriate qualification standards in conformity with the equal employment opportunity and non-discrimination principles set forth in this chapter. However, a contractor or subcontractor shall determine that the individual at least possesses the requisite skills, and experience recognized by a union, apprentice program or a referral agency, provided the referral agency is acceptable to the Dept. of LWD, Construction EEO Monitoring Program. If necessary, the contractor or subcontractor shall hire or schedule minority and women workers who qualify as trainees pursuant to these rules. All of the requirements, however, are limited by the provisions of (C) below.
 - (iii) The name of any interested women or minority individual shall be maintained on a waiting list, and shall be considered for employment as described in (i) above, whenever vacancies occur. At the request of the 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 apprenticeship policies in any applicable collective bargaining agreement or union hiring hall arrangement, and, where required by custom or agreement, it shall send journeymen and trainees to the union for referral, or to the apprenticeship program for admission, pursuant to such agreement or arrangement. However, where the practices of a union or apprenticeship program will result in the exclusion of minorities and women or the failure to refer minorities and women consistent with the targeted county employment goal, the contractor or subcontractor shall consider for employment persons referred pursuant to (B) above without regard to such agreement or arrangement; provided further, however, that the contractor or subcontractor shall not be required to employ women and minority advanced trainees and trainees in numbers which result in the employment of advanced trainees and trainees as a percentage of the total workforce for the construction trade, which percentage significantly exceeds the apprentice to journey worker ratio specified in the applicable

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

After notification of award, but prior to signing a construction contract, the contractor shall submit to the public agency compliance officer and the 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 website, for distribution to and completion by the contractor, in accordance with N.J.A.C. 17:27-7. The contractor also agrees to submit a copy of the Monthly Project Workforce Report once a month thereafter for the duration of this contract to the 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 requested 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.

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

The contractor and the City of Vineland, (hereafter "City") do hereby agree that the provisions of Title 11 of the Americans with Disabilities Act of 1990 (the "Act") (42 U.S.C. SJ 21 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 City 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 City in any action or administrative proceeding commenced pursuant to this Act. The contractor shall indemnify, protect, and save harmless the City, 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 City's grievance procedure, the contractor agrees to abide by any decision of the City which is rendered pursuant to said grievance procedure. If any action or administrative proceeding results in an award of damages against the City, or if the City 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 City 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 City or any of its agents, servants, and employees, the City shall expeditiously forward or have forwarded to the contractor every demand, complaint, notice, summons, pleading, or other process received by the City or its representatives.

It is expressly agreed and understood that any approval by the City 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 City pursuant to this paragraph.

It is further agreed and understood that the City 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 City from taking any other actions available to it under any other provisions of the Agreement or otherwise at law.



CITY OF
VINELAND
WHERE IT'S ALWAYS GROWING SEASON

**CITY OF VINELAND
DIVISION OF PLANNING AND FACILITIES**

**TECHNICAL
SPECIFICATIONS**

FOR

**CITY OF VINELAND
PUBLIC WORKS FACILITY BUILDINGS
78 WEST PARK AVENUE**

APRIL 14, 2026

PREPARED BY

**CITY OF VINELAND
DIVISION OF PLANNING AND FACILITIES
RYAN R. HEADLEY, PE, PP, AICP, CME
640 E. WOOD STREET, P.O. BOX 1508
VINELAND, NJ 08362-1508
TEL: 856-794-4101
FAX: 856-405-4606**

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GENERAL CONDITIONS AND GENERAL SPECIFICATIONS

101 DEFINITIONS

Whenever used in any of the Contract Documents, the following meanings shall be given to the terms herein defined:

- A. The term "Contract" means the contract executed by the City of Vineland and the Contractor.
- B. The term "Local Public Agency" means the City of Vineland which is authorized to undertake the contract.
- C. The term "Contractor" means the person, firm or corporation entering into the Contract with the City of Vineland to construct and install the improvements embraced in these specifications.
- D. The term "Project Area" means the working site and environs within which are the specified Contract limits of the improvements contemplated to be constructed in whole or in part under this contract.
- E. The term "Engineer" means the Project Engineer or his designated representative.
- F. The term "Local Government" means the City of Vineland, New Jersey.
- G. The term "Drawings" means the drawings listed in the schedule of Drawings.
- H. The term "Detailed Specifications" means that part of the specifications which describes, outlines, and stipulates: the quality of the materials to be furnished, the quality of workmanship required, and the methods to be used in carrying out the construction work to be performed under this contract.
- I. The term "Addendum" or "Addenda" means any changes or revisions of the contract documents which have been duly issued by the Local Public Agency to prospective bidders prior to the time of receiving bids.
- J. The term "Source Documentation" means written or photographic evidence relative to the project. This shall include, but not be limited to, delivery slips, made in America certifications, field orders, inspection reports, photographs, approved submittals, as-built plans, hand marked plans, computations.

102 SUPERINTENDENCE BY CONTRACTOR

- A. The Contractor shall provide a competent superintendent on the work at all times during working hours with full authority to act for him. The Contractor shall also provide an adequate staff for the proper coordination and expediting of his work.

- B. The Contractor shall supervise his own work and he shall be responsible for all work executed by him under the Contract. He shall verify all figures, alignment and elevations before proceeding with the work and will be held responsible for any error resulting from his failure to do so.

103 SUBCONTRACTS

- A. The Contractor shall not execute any agreement with any subcontractor or permit any subcontractor to perform any work included in this contract until he has submitted a non-collusive affidavit from the subcontractor in substantially the form as attached in these documents and has received written approval of such subcontractor from the City of Vineland.
- B. No proposed subcontractor shall be disapproved by the City of Vineland except for cause.
- C. The Contractor shall be as fully responsible to the City of Vineland for the acts and omissions of his subcontractors, and of the persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.
- D. The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to require compliance by each subcontractor with the applicable provisions of the contract for the improvement embraced in this specification.
- E. Nothing contained in the contract shall create any contractual relation between any subcontractor and the City of Vineland.

104 OTHER CONTRACTS

The City of Vineland may award, or may have awarded other contracts for additional work and the Contractor shall cooperate fully with such other Contractors, by scheduling his own work with that to be performed under other contracts as may be directed by the City of Vineland. The Contractor shall not commit or permit any act which will interfere with the performance of work by any other Contractor as scheduled.

In the event that the Traffic Control Plans (TCP) for the Contractor overlaps with that of another Contractor in the employ of the City, City Engineer will direct revisions as needed. A change order will be prepared for any changes made to the Traffic Control pay items.

105 FITTING AND COORDINATION OF THE WORK

The Contractor shall be responsible for the proper fitting of all work and for the coordination of the operation of all trades, subcontractors, or material engaged upon this contract. He shall be prepared to guarantee to each of his subcontractors the locations and measurements which they may require for the fitting of their work and all surrounding work.

106 MUTUAL RESPONSIBILITY OF CONTRACTORS

If (through acts or neglect on the part of the Contractor) any other Contractor, or any subcontractor shall suffer loss or damage on the work, the Contractor shall settle with such other Contractor or subcontractor by agreement or arbitration, if such other Contractor or subcontractor will so settle. If such other Contractor or subcontractor shall assert any claim against the City of Vineland on account of any damage alleged to have been so sustained, the City of Vineland will notify this Contractor, who shall defend at his own expense any suit based upon such claim, and, if any judgment or claims against the City of Vineland shall be allowed, the Contractor shall pay or satisfy such judgment or claim and pay all costs and expenses in connection therewith.

107 PROGRESS SCHEDULE

The Contractor shall submit for approval immediately after execution of the contract, a carefully prepared Progress Schedule, showing the proposed dates of starting and completing each of the various sections of work. This schedule shall be updated regularly and as directed by the City Engineer.

108 PAYMENTS TO THE CONTRACTOR

A. PARTIAL PAYMENTS

1. Contractor must submit request for partial payment monthly on standard City of Vineland vouchers to the Engineer for his approval. Processing of request for payment shall be in accordance with Instructions to Bidders and the Local Public Contracts Law. Payment requests are considered to be incomplete if certified weekly payroll forms and monthly, quarterly, or yearly reporting documents (as needed) are not provided with reimbursement requests. Payment will not be made for items installed without approved submittals or appropriate source documentation.
2. Monthly or partial payments made by the City of Vineland to the Contractor are monies advanced for the purpose of assisting the Contractor to expedite the work of construction. The Contractor shall be responsible for the care and protection of all materials and work upon which payments have been made until final acceptance of such work and materials by the City of Vineland. Such payments shall not constitute a waiver of the right of the City of Vineland to require the fulfillment of all terms of the contract and the delivery of improvements embraced in this contract complete and satisfactory to the City of Vineland in all details.

B. FINAL PAYMENT

1. After final inspections and acceptance by the City of Vineland of all work under the contract, the Contractor shall prepare his request for final payment which shall be based upon the carefully measured or computed

quantity of each item of work at the applicable unit prices stipulated in the contract. The total amount of the final payment due the Contractor under this contract shall be the amount computed as described above less all previous payments. Final payment to the Contractor shall be made subject to his furnishing the City of Vineland with a release in satisfactory form of all claims against the City of Vineland arising under and by virtue of contract, other than such claims, if any, as may be specifically excepted by the Contractor from the operation of the release as provided in this specification. Payment will not be made for items installed without approved submittals or appropriate source documentation.

2. The City of Vineland, before paying the final estimate, may require the Contractor to furnish releases or receipts from all subcontractors, having performed any work and all persons having supplied materials, equipment (installed on the project) and services to the Contractor, if the City of Vineland deems the same necessary in order to protect its interest. The City of Vineland, however, may, if it deems such action advisable, make payment in part or in full to the Contractor without requiring the furnishing of such releases or receipts and any payments so made shall nowise impair the obligations of any surety or sureties furnished under this contract.
3. Withholding of any amount due the City of Vineland (LIQUIDATED DAMAGES, PENALTIES) shall be deducted from the final payment due the Contractor.
 - a. Amounts due the City of Vineland may include, but are not necessarily limited to, Liquidated Damages, performance or material penalties, costs related to overtime inspection, failure to meet employment goals.

C. WITHHOLDING PAYMENTS

The City of Vineland may withhold from any payment otherwise due the Contractor so much as may be necessary to protect the City of Vineland and if it so elects may also withhold any amounts due from the Contractor to any subcontractor or material dealers for work performed or material furnished by them. The foregoing provisions shall be constructed solely for the benefit of the City of Vineland and will not require the City of Vineland to determine or adjust any claims or disputes between the Contractor and his subcontractors or material dealers, or to withhold any monies for their protection unless the City of Vineland elects to do so. The failure or refusal of any monies from the Contractor shall nowise impair the obligations of any surety or sureties under any bond furnished under this contract.

109 TERMINATION, LIQUIDATED DAMAGES, AND TIME MODIFICATIONS

A. TERMINATION OF CONTRACT

If the Contractor refuses or fails to prosecute the work with such diligence as will insure its completion within the time specified in these contract documents, or as modified as provided in these contract documents, the City of Vineland, by written notice to the Contractor, may terminate the Contractor's right to proceed with the work. Upon such termination, the City of Vineland may take over the work and prosecute the same to completion, by contract or otherwise, and the Contractor and his sureties shall be liable to the City of Vineland for any additional cost incurred by the City of Vineland in its completion of the work and they shall also be liable to the City of Vineland for liquidated damages for any delay in the completion of the work as provided below. If the Contractor's right to proceed is so terminated, the City of Vineland may take possession of and utilize in completing the work such materials, tools, equipment and plant as may be on the site of the work and necessary therefore.

B. LIQUIDATED DAMAGES FOR DELAYS

If the work is not completed within the time stipulated, including any extensions of time for excusable delays, the Contractor shall pay to the City of Vineland liquidated damages for each calendar day of delay, until the work is completed, the amount set forth and the Contractor and his sureties shall be liable to the City of Vineland for the amount thereof.

C. TIME MODIFICATIONS

Refer to Section 108.11, "Modifications to Contract Time," in the Standard Specifications for Road and Bridge Construction, 2019

110 ASSIGNMENT OR NOVATION

The contractor shall not assign or transfer, whether by an assignment or novation, any of its rights, duties, benefits, obligations, liabilities, or responsibilities under this contract without the written consent of the City of Vineland; provided, however, that assignments to banks, trust companies, or other financial institutions may be made without the consent of the City of Vineland. No assignment or novation of this contract shall be valid unless the assignment or novation expressly provides that the assignment of any of the Contractor's rights or benefits under the contract is subject to prior lien for labor performed, services rendered, and materials, tools, and equipment supplied for the performance of the work under this contract in favor of all persons, firms, or corporations rendering such labor or services supplying such materials, tools or equipment.

111 TECHNICAL SPECIFICATIONS AND DRAWINGS

Anything mentioned in the TECHNICAL SPECIFICATIONS and not shown on the drawings, or shown on the drawings and not mentioned in the TECHNICAL SPECIFICATIONS, shall be of like effect as if shown on or mentioned in both. In case of difference between drawings and

TECHNICAL SPECIFICATIONS, the TECHNICAL SPECIFICATIONS shall govern. In case of any discrepancy in drawings, or TECHNICAL SPECIFICATIONS, the matter shall be immediately submitted to the City of Vineland, without whose decision, said discrepancy shall not be adjusted by the Contractor.

112 SHOP DRAWINGS

- A. All required shop drawings, machinery details, layout drawings, etc. shall be submitted to the Engineer in five (5) copies for approval sufficiently in advance of requirements to afford ample time for checking, including time for correcting, re-submitting and re-checking if necessary. The Contractor may proceed only at his own risk, with manufacture or installation of any equipment or work covered by said shop drawings, etc. until they are approved. No claim, by the Contractor, for extension of the contract time will be granted by reason of his failure in respect.

- B. Any drawings submitted without the Contractor's stamp of approval will not be considered and will be returned to him for proper re-submission.

If any drawings show variations from the requirements of the contract because of standard shop practice or other reason, the Contractor shall make specific mention of such variation in his letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment of contract price and/or time otherwise the Contractor will not be relieved of the responsibility for executing the work in accordance with the contract even though the drawings have been approved.

- C. If a shop drawing is in accordance with the contract or involves only a minor adjustment in the interest of the City of Vineland not involving a change in contract price or time, the Engineer may approve the drawing. The approval shall be general, shall not relieve the Contractor from his responsibility for adherence to the contract for any error in the drawing, and shall contain in substance the following:

"The modification shown on the attached drawing is approved in the interest of the City of Vineland to effect an improvement of the Project and is ordered with the understanding that it does not involve any change in the contract price or time; that it is subject generally to all contract stipulations and covenants; and that it is without prejudice to any and all rights of the City of Vineland under the contract and surety bond or bonds."

113 REQUESTS FOR SUPPLEMENTARY INFORMATION

It shall be the responsibility of the Contractor to make timely requests of the City of Vineland for any additional information not already in his possession which should be furnished by the City of Vineland under terms of this contract, and which he will require in the planning and execution of the work. Such requests may be submitted from time to time as the need is

approached, but each shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay. Each request shall be in writing, and list the various items and the latest date by which each will be required by the Contractor. The first request shall be submitted within two weeks after contract award and shall be as complete as possible at that time. The Contractor shall, if requested, furnish promptly any assistance and information the Engineer may require in responding to these requests of the Contractor. The Contractor shall be fully responsible for any delay in his work or to others arising from his failure to comply fully with the provisions of this Section.

114 MATERIALS, EQUIPMENT, AND PERSONNEL

- A. Unless otherwise specifically provided for in the TECHNICAL SPECIFICATIONS, all materials and articles incorporated in the work shall be new and the best grade of the respective kinds for the purpose. Where materials or articles are referred to in the TECHNICAL SPECIFICATIONS as "equal to" any particular standard, the Engineer shall decide the question of equality.
- B. The Contractor shall furnish to the City of Vineland for approval the manufacturer's detailed specifications for all machinery, mechanical and other special equipment, which he contemplates utilizing together with full information as to type, performance, characteristics, and all other pertinent information as required. Machinery, mechanical and other equipment used without such prior approval shall be at the risk of subsequent rejection and shall likewise submit for approval as required full information concerning all other materials or articles which he proposes to incorporate in the work.
- C. The Contractor shall furnish to the City of Vineland for approval the manufacturer's detailed specifications for all materials, which he contemplates installing together with full information as to type, performance, characteristics, and all other pertinent information as required. Materials installed without such prior approval shall be at the risk of subsequent rejection.
- D. Materials specified by reference to the number or symbol of specific standard, such as an ASTM Standard, a Federal Specification or other similar standard, shall comply with requirements in the latest revision thereof and any amendment or supplement thereto in effect on the date of the Notice to Bidders, except as limited to type, class or grade, or modified in such reference. The standards referred to, except as modified in the TECHNICAL SPECIFICATIONS, shall have full force and effect as though printed therein.
- E. No materials to be installed in the project shall be delivered to the site without a representative of the Contractor present to receive said materials. All materials are to be accompanied with a delivery slip and, for iron and steel materials, a certification as to the origin of manufacture. The only acceptable location for manufacture is the United States of America. A copy of the delivery slip and certification shall be provided to the City.
- F. The City of Vineland may require the Contractor to dismiss from the work such employee or employees who, in the opinion of the Engineer, are not performing

the work in a proper or skillful manner, or are intemperate, disorderly, or create a hostile environment. Do not allow the removed employee to be re-employed to perform any portion of the work without written approval by the Engineer.

115 SAMPLES, CERTIFICATIONS AND TESTS

- A. The Contractor shall submit all material or equipment samples, certificates, affidavits, etc. as called for in the contract documents or required by the Engineer, promptly after award of the contract and acceptance of the Contractor's bond. No such material or equipment shall be manufactured or delivered to the site, except at the Contractor's own risk, until the required samples or certificates have been approved in writing by the Engineer. Any delay in the work caused by late or improper submission of samples or certificates for approval shall not be considered just cause for an extension of the contract time.

Each sample submitted by the Contractor shall carry a label giving the name of the Contractor, the project for which it is intended, and the name of the producer. The accompanying certificate or letter from the Contractor shall state that the sample complies with contract requirements, shall give the name and brand of the product, its place of origin, the name and address of the producer and all specifications or other detailed information which will assist the Engineer in passing upon the acceptability of the sample promptly. It shall also include the statement that all materials or equipment furnished for use in the project will comply with the samples and/or certified statements.

- B. Approval of any materials shall be general only and shall not constitute a waiver of the City of Vineland's right to demand full compliance with contract requirements.

After such deliveries, the Engineer will have such check tests made as he deems necessary in each instance and may reject materials and equipment and accessories for cause, even though such equipment or accessories which fail to meet check tests have been incorporated in the work, the Engineer will have the right to cause their removal and replacement by proper materials or to demand and secure such reparation by the Contractor as is equitable.

- C. Prior to installation of iron or steel materials, the City shall be provided with a certification from the manufacturer (not supplier) as to the place of origin of said materials. Items installed with iron or steel components shall not be deemed acceptable for payment without certification as to origin of manufacture. The only acceptable location for manufacture is the United States of America.
- D. Except as otherwise specifically stated in the contract, the costs of sampling and testing shall be borne by the Contractor.

116 PERMITS AND CODES

- A. The Contractor shall give all notices required by and comply with all applicable

laws, ordinances, and codes of the Local government. All construction work and/or utility installation shall comply with all applicable ordinances and codes, including all written waivers. Before installing any work, the Contractor shall examine the Drawings and TECHNICAL SPECIFICATIONS for compliance with applicable ordinances and codes and shall immediately report any discrepancy to the City of Vineland. Where the requirements of the Drawings and TECHNICAL SPECIFICATIONS fail to comply with such applicable ordinances or codes, the City of Vineland will adjust the contract by Change Order to conform to such ordinances or codes and make the appropriate adjustment in the contract price or stipulated unit prices.

Should the Contractor fail to observe the ongoing provisions and proceed with the construction and/or install any utility at variance with the applicable ordinance or code, including any written waivers (notwithstanding the fact that such installation is in compliance with the Drawings and TECHNICAL SPECIFICATIONS), the Contractor shall remove such work without cost to the City of Vineland, but a Change Order will be issued to cover only the excess cost the Contractor would have been entitled to receive if the change had been made before the Contractor commenced work on the items involved.

- B. The Contractor shall comply with applicable local laws and ordinances governing the disposal of the surplus excavation, materials, debris and rubbish on or off the Project Area and commit no trespassing on any public or private property in any operation connected with the improvements embraced in this contract.

117 CARE AND PROTECTION OF WORK, PROPERTY AND PERSONS

- A. The Contractor will be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work.

He will take all necessary precautions for safety of and will provide the necessary protection to prevent damage, injury or loss to all employees on the work and other persons who may be affected thereby, all the work and all materials or equipment to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

At no point in time shall open excavations be left open and unattended. Open excavations that cannot be backfilled prior to the end of the working day shall be covered with a steel plate and properly protected in a manner agreeable to the City Engineer.

Where practicable, pedestrian pathways shall be restored at the end of each working day to the full extent of the sidewalk, but in no cases less than four (4) feet wide.

- B. The Contractor will comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. He will erect and maintain, as required by the conditions and progress of the work, all necessary safeguards for

safety and protection. He will notify owners of adjacent utilities when prosecution of the work may affect them. The Contractor will remedy all damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the Contractor, any subcontractor or anyone directly or indirectly employed by the Contractor.

- C. In emergencies affecting the safety of persons or the work or property at the site or adjacent thereto, the Contractor without special instruction or authorization from the Engineer or the City of Vineland, shall act to prevent threatened damage, injury or loss. He will give the Engineer prompt WRITTEN NOTICE of any significant changes in the work or deviation from the contract documents caused thereby, and a Change Order shall thereupon be issued covering the changes and deviations involved.
- D. SUPERVISION BY THE CONTRACTOR: The Contractor will supervise and direct the work. He will be solely responsible for the means, methods, techniques, sequences and procedures of the construction. The Contractor will employ and maintain on the work site a qualified and competent supervisor or superintendent who shall have been designated in writing by the Contractor as the Contractor's representative at the site. The supervisor shall have full authorization to act on behalf of the Contractor and all communication given to the supervisor shall be as binding as if given to the Contractor. The supervisor shall be present on the site at all times as required to perform adequate supervision and coordination of the work.
- E. The Contractor shall shore up, brace, underpin, secure and protect as may be necessary, all foundations and other parts of existing structures adjacent to, adjoining and in the vicinity of the site, which may be in any way affected by the excavation or other operations connected with the construction of the improvements embraced in this contract. The Contractor shall be responsible for giving of any and all required notices to any adjoining property owner or other party before the commencement of any work. The Contractor shall indemnify and save harmless the City of Vineland from adjoining property and from all loss or expense and all damages for which the City of Vineland may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.

118 ACCIDENT PREVENTION

- A. The Contractor shall exercise proper precautions at all times for protection of persons and property and shall be responsible for all damages to persons or property, either on or off the site, which occur as a result of his prosecution of work. The safety provisions of applicable laws and building and construction codes shall be observed and the Contractor shall take or cause to be taken such additional safety and health measures as the City of Vineland may determine to be reasonably necessary. Machinery, equipment and all hazards shall be guarded in accordance with the safety provisions of the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, Inc. to the extent that such provisions are not in conflict with applicable local laws.

- B. The Contractor shall maintain an accurate record of all cases of death, occupational disease or injury requiring medical attention or causing loss of time for work, arising out of and in the course of employment on work under the contract. The Contractor shall promptly furnish the City of Vineland with reports concerning these matters.
- C. INDEMNIFICATION: The Contractor will indemnify and hold harmless the City of Vineland and the Engineer and their agents and employees from and against all claims, damages, losses and expenses including attorney's fees arising out of or resulting from the performance of work, provided that any such claims, damage, loss or expense attributable to bodily injury, sickness, disease or death or to injury to or destruction of tangible property including the loss of use resulting there from and is caused in whole or in part by any negligent or willful act or omission of the Contractor or subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

In any and all claims against the City of Vineland or the Engineer, or any of their agents or employees, by any employee of the contractor, and subcontractor, any one directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or any type of damages, compensation or benefits payable by or for the contractor or any subcontractor under workmen's compensation acts, disability benefit acts or other employee benefit acts.

119 SANITARY FACILITIES

The Contractor shall furnish, install and maintain ample sanitary facilities for the workmen. As the needs arise, a sufficient number of enclosed temporary toilets shall be conveniently placed as required by the sanitary codes of the State and Local Government. Drinking water shall be provided from an approved source, so piped or transported as to keep it safe and fresh, served from single service containers or satisfactory types of sanitary drinking water stands or fountains. All such facilities and services shall be furnished in strict accordance with the existing and governing health regulations.

120 USE OF PREMISES

- A. The Contractor shall confine his equipment, storage of materials, and construction operations to Contract Limits as shown on the Drawings and as prescribed by ordinances or permits, or as may be desired by the City of Vineland, and shall not unreasonably encumber the site or public rights of way with his materials and construction equipment.
- B. The Contractor shall comply with all reasonable instructions of the City of Vineland and the ordinances and codes of the Local Government, regarding signs, advertising, traffic, fires, explosives, danger signals and barricades.
- C. In the event that the Contractor enters into a contract with a property owner for the storage of machinery and/or materials, a copy of said agreement shall be

provided to the Engineer prior to the use of said premises.

121 REMOVAL OF DEBRIS, CLEANING, ETC.

The Contractor shall, periodically or as directed during the progress of the work, remove and legally dispose of all surplus excavated material and debris, and keep the Project Area and public rights-of-way reasonably clear. Upon completion of the work, he shall remove all temporary construction facilities, debris and unused materials provided for the work, and put the whole site of the work and public right-of-way in a neat and clean condition. Trash burning on the site of the work will not be permitted.

122 INSPECTION

- A. All materials and workmanship shall be subject to inspection, examination or test by the City of Vineland and the Engineer at any and all times during the manufacture or construction and at any and all places where such manufacture or construction is carried on. The City of Vineland shall have the right to reject defective material and workmanship or require its correction. Unacceptable workmanship shall be satisfactorily corrected. Rejected material shall be promptly segregated and removed from the Project Area and replaced with material of specified quality without charge therefore. If the Contractor fails to proceed at once with the correction of rejected workmanship or defective material, the City of Vineland may, by contract or otherwise, have defects remedied or rejected materials removed from the Project Area and charge the cost of the same against any monies which may be due the Contractor, without prejudice to any other rights of the City of Vineland.
- B. The Contractor shall furnish promptly all materials reasonably necessary for any tests which may be required. All tests by the City of Vineland will be performed in such manner as not to delay the work unnecessarily and will be made in accordance with the provisions of the TECHNICAL SPECIFICATIONS.
- C. The Contractor shall notify the City of Vineland sufficiently in advance of backfilling or concealing any facilities to permit proper inspection. If any facilities are concealed without approval or consent of the City of Vineland, the Contractor shall uncover for inspection and recover such facilities at his own expense, when so requested by the City be considered necessary or advisable by the City of Vineland at any time before final acceptance of the entire work to make an examination of work already completed by uncovering the same, the Contractor shall on request promptly furnish all necessary facilities, labor and material. If such work is found to be defective in any important or essential respect, due to fault of the Contractor or his subcontractors, the Contractor shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work, is found to meet the requirement of the contract, the actual cost of labor and material necessarily involved in the examination and replacement, plus 15 percent of such costs to cover superintendence, general expenses and profit, shall be allowed the Contractor and he shall, in addition, if completion of the work of the entire contract has been delayed thereby, be granted a suitable extension of time

on account of the additional work.

- D. Inspection of materials and appurtenances to be incorporated in the improvements embraced in this contract may be made at the place of production, manufacture or shipment, whenever the quantity justifies it, and such inspections and acceptance, unless otherwise stated in the TECHNICAL SPECIFICATIONS, shall be final, except as regards (1) latent defects, (2) departures from specific requirements of the contract, (3) damage or loss in transit, or (4) fraud or such gross mistakes as amount to fraud. Subject to the requirements contained in the preceding sentence, the inspection of materials as a whole or in part will be made at the Project Site.
- E. Neither inspection, testing, approval nor acceptance of the work in whole or in part, by the City of Vineland or its agents shall relieve the contractor or his sureties of full responsibility for materials furnished or work performed not in strict accordance with the contract.
- F. **In the event that work is performed outside normal working hours, on weekend days, or City Holidays, the Contractor will be responsible for paying overtime wages for any inspection Costs incurred by the City during this time.**
 - i. Rates for overtime inspection costs shall be provided to the Contractor upon request to perform work outside of the normal working hours, and approval by the City Engineer for such work to be performed.
 - ii. The cost of overtime inspection will be deducted from any payments owed to the Contractor.
 - iii. City Holidays are:
 - a. New Year's Day
 - b. Martin Luther King Jr. Day
 - c. Presidents' Day
 - d. Good Friday
 - e. Memorial Day
 - f. Juneteenth
 - g. Independence Day
 - h. Labor Day
 - i. Columbus Day
 - j. Election Day
 - k. Veterans Day
 - l. Thanksgiving Day
 - m. Day after Thanksgiving
 - n. Christmas Day

123 REVIEW BY LOCAL PUBLIC AGENCY

The City of Vineland, its authorized representatives and agents shall, at all times, have access to and be permitted to observe and review all work, materials, equipment, payrolls, personnel records, employment conditions, material invoices, and other relevant data and records pertaining to this contract.

124 FINAL INSPECTION

When the improvements embraced in this contract are substantially completed, the Contractor shall notify the City of Vineland in writing that the work will be ready for final inspection on a definite date which shall be stated in the notice. The notice will be given at least ten (10) days prior to the date stated for final inspection, and bear the signed concurrence of the representative of the City of Vineland having charge of inspection. If the City of Vineland determines that the status of the improvements is as represented, it will make the arrangements necessary to have final inspection commenced on the date stated in the notice, or as soon thereafter as is practicable.

125 DEDUCTION FOR UNCORRECTED WORK

If the City of Vineland deems it not expedient to require the Contractor to correct work not done in accordance with the contract documents, an equitable deduction from the contract price will be made by agreement between the Contractor and the City of Vineland and subject to settlement, in case of dispute, as herein provided.

126 INSURANCE

Evidence of the following insurance requirements must be filed with the Department of Administration and made a matter of record with respect to the Contract to be entered into herewith:

- A. Workmen's Compensation and Occupational Disease Insurance in accordance with the applicable law or laws. Employer's Liability Insurance with limit of liability of at least \$500,000.
- B. Comprehensive General Liability with limits of \$1,000,000/\$2,000,000 Bodily Injury and \$1,000,000 Property Damage.
- C. Broad Form Blanket Contractual Liability for liability assumed under this contract and all other contracts relative to the project.
- D. Completed Operations/Product Liability with a two (2) year extension beyond completion and acceptance of the project.
- E. Broad Form Property Damage.
- F. XC&U Perils: This exclusion relates to explosion, collapse and underground hazards which are inherent in this type of work. In these cases, the XC&U exclusions in the Contractors liability policy should be deleted.
- G. Personal Injury Liability A, B & C with employee exclusion voided.
- H. Comprehensive Automobile Liability insurance covering the use of all owned, non-owned and hired automobiles with a Bodily Injury and Property Damage limit

of \$1,000,000.00.

The Contractor must include the City of Vineland as an additional insured on their certificate of insurances.

127 PATENTS

The Contractor shall hold and save the City of Vineland, its officers, and the employees, harmless from liability of any nature or kind, including costs and expenses, for or on account of, any patented or unpatented invention, process, article or appliance manufactured or used in the performance of the contract, including its use by the City of Vineland, unless otherwise specifically stipulated in the TECHNICAL SPECIFICATIONS.

128 WARRANTY OF TITLE

No material, supplies or equipment to be installed or furnished under this contract shall be purchased subject to any chattel mortgage or under a conditional sale, lease-purchase or other agreement by which an interest therein or in any part thereof is retained by the seller or supplier. The Contractor shall warrant good title to all materials, supplies and equipment installed or incorporated in the work and upon completion of all work, shall deliver the same together with all improvements and appurtenances constructed or placed hereon by him to the City of Vineland free from any claims, liens or charges. Neither the Contractor, nor any person, firm nor corporation furnishing any materials or labor for any work covered by this contract shall have any right to a lien upon any improvement or appurtenance thereon.

Nothing contained in this paragraph, however, shall defeat or impair the right of persons furnishing materials or labor to recover under any bond given by the Contractor for their protection or any rights under any law permitting such persons to look to funds due the Contractor in hands of the City of Vineland. The provisions of this paragraph shall be inserted in all subcontracts and material contracts and notice of its provisions shall be given to all persons furnishing materials for the work when no formal contract is entered into for such materials.

129 GENERAL GUARANTY

Neither the final certificate of payment nor any provisions in the contract nor partial or entire use of the improvements embraced in this contract by the City of Vineland or the public shall constitute an acceptance of work not done in accordance with the contract or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall promptly remedy any defects in the work and pay for any damage to other work resulting there from which shall appear within a period of twenty four (24) months from the date of final acceptance of the work. This shall be ensured through the posting of a Maintenance Bond in an amount not less than one hundred (100) percent of the final contract amount. The City of Vineland will give notice of defective materials and work with reasonable promptness.

130 PROJECT SITE

The Project Site consists of the area(s) described in the "Detailed Specifications" section of these specifications.

131 TIME OF COMPLETION

The work which the contractor is required to perform under this contract shall be commenced at the time stipulated by the Local Public Agency in the Contractor's Notice to Proceed and shall be fully completed within the time limit noted in the "General Instruction to Bidders" section of these specifications.

132 LIQUIDATED DAMAGES

As actual damages for any delay in completion of the work which the Contractor is required to perform under this contract, the Contractor and his sureties shall be liable for and shall pay to the Local Public Agency the sum of one thousand five hundred dollars (\$1,500) as fixed and agreed upon liquidated damages for each and every calendar day of delay from the above stipulated time for completion, or as modified in accordance with Section 109 hereof, until such work is satisfactorily completed and accepted.

133 RESPONSIBILITIES OF CONTRACTOR

Except as otherwise specifically stated in the CONTRACT DOCUMENTS and TECHNICAL SPECIFICATIONS, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, heat, power, transportation, superintendence, temporary construction of every nature, charges, levies, fees or other expenses and all other services and facilities of every nature whatsoever necessary for the performance of the Contract and to deliver any improvements embraced in this contract complete in every respect within the specified time.

134 COMMUNICATIONS

- A. All notices, demands, requests, instructions, approvals, proposals and claims must be in writing.
- B. Any notice to or demand upon the Contractor shall be sufficiently given if delivered at the office of the Contractor stated on the signature page of the Agreement (or at such other offices at the Contractor may from time to time designate in writing to the Local Public Agency), or if deposited in the United States Mail in a sealed, postage prepaid envelope, transmitted electronically via email with delivery receipt, or sent via facsimile, in each case addressed to such office.
- C. All papers required to be delivered to the Local Public Agency shall, unless otherwise specified in writing to the Contractor, be delivered to the City Engineer in City Hall, and any notice to or demand upon the Local Public Agency shall be

sufficiently given if so delivered, or if deposited in the United States Mail in a sealed, postage prepaid envelope, transmitted electronically via email with delivery receipt, or sent via facsimile, to said Local Public Agency or to such other address as the Local Public Agency may subsequently specify in writing to the Contractor for such purpose.

- D. Any such notice shall be deemed to have been given as of the time of actual delivery or in the case of mailing when the same should have been received in due course of post, or in the case of emails or facsimiles, at the time of actual receipt, as the case may be.

135 JOB OFFICES

- A. The Contractor shall furnish and maintain, during construction of improvements embraced in this contract adequate facilities on the Project Area or adjacent thereto for the use of the Local Public Agency and its Engineers.
- B. The Contractor and his subcontractors may maintain such office and storage facilities on the site that are necessary for the proper conduct of the work. These shall be located so as to cause no interference to any work to be performed on the site. The Local Public Agency shall be consulted with regard to their locations.
- C. Upon completion of the improvements, or as directed by the Local Public Agency, the Contractor shall remove all such temporary structures and facilities from the site, same to become his property, and leave the site of the work in the condition required by the contract.

136 PARTIAL USE OF SITE IMPROVEMENTS

The Local Public Agency, at its discretion, may give notice to the Contractor and place in use those sections of the improvements which have been completed, inspected and can be accepted as complying with the TECHNICAL SPECIFICATIONS and, if in its opinion, each such section is reasonably safe, fit and convenient, for the use and accommodation for which it was intended provided that:

- A. The use of such sections of the improvements shall in no way impede the completion of the remainder of the work by the Contractor.
- B. The Contractor shall not be responsible for any damages or maintenance costs due directly to the use of such sections.
- C. The use of such Sections shall in no way relieve the Contractor of his liability due to having used defective materials or to poor workmanship.
- D. The period of guarantee stipulated in Section 129 hereof shall begin on the date of the final acceptance of all work which the Contractor is required to construct under this contract.

137 CORRECTION OF WORK

The Contractor shall promptly remove from the premises all work rejected by the Engineer for failure to comply with the CONTRACT DOCUMENTS, whether incorporated in the construction or not, and the Contractor shall promptly replace and re-execute the work in accordance with the CONTRACT DOCUMENTS and without expense to the Local Public Agency and shall bear the expense of making good all work of the Contractor's destroyed or damaged by such removal or replacement.

All removal and replacement work shall be done at the Contractor's expense. If the Contractor does not take action to remove such rejected work within ten (10) days after receipt of written notice, the Local Public Agency may remove such work and store the materials at the expense of the Contractor.

Should the rejected work be deemed unsafe/hazardous....immediate action shall be taken.

138 CONTRACT DOCUMENTS AND DRAWINGS

The Local Public Agency will furnish the Contractor without charge two (2) copies of the CONTRACT DOCUMENTS, including TECHNICAL SPECIFICATIONS and Drawings. Additional copies requested by the Contractor will be furnished at cost. Fees in accordance with Ordinance

139 SITE MAINTENANCE

The Contractor shall be responsible for maintaining all existing road pavements, drives, curbing, sidewalks, fencing, lawns, and all other structures which may be affected by the Contractor's access to or work in the project area. Damaged facilities shall be repaired or replaced at no cost to the City of Vineland.

140 NOTIFICATION OF PROPERTY OWNERS

The Contractor shall notify the owners/tenants of properties adjoining the work area at least 48 hours prior to the time he proposes to begin work which will interfere with their normal passage. Proof of notification shall be supplied to the City.

The notification shall be reviewed and approved by the City Engineer prior to distribution.

GENERAL INSTRUCTIONS TO BIDDERS

1. The work performed under this contract shall comply with all requirements of the NJDOT Standard Specifications for Road and Bridge Construction 2019, as amended, except as modified or supplemented herein, which specifications are made a part of these specifications.
2. Whenever the words "DEPARTMENT" or "COMMISSIONER" appears in the text, their meanings shall be "CITY OF VINELAND" and "CITY OF VINELAND ENGINEER", respectively.
3. The Contractor may use whatever type of equipment he desires or has available, provided it is maintained in good condition and is adequate to complete the work as directed by the Engineer. No equipment required to perform any portion of the work will be considered special equipment, and the Contractor shall include the cost of such equipment in the price bid for the items specified in this proposal.
4. The price bid for each item in the proposal shall be for all materials, labor, equipment and all else necessary for the completion of the respective items.
5. MATERIALS: Materials will be accepted on the basis of inspection, testing and/or certification as directed by the Engineer. All materials must be approved prior to incorporation of work. Concrete and other material samples may be taken periodically for testing to ensure adequate strength and conformance with specifications.
6. PEDESTRIAN TRAFFIC CONTROL: The Contractor will be responsible for pedestrian traffic control and safety during all phases of work. Whenever possible, pedestrian traffic shall be re-routed around and prevented from entering work area. Sidewalks closed to pedestrian traffic shall be protected by effective barricades and signage in accordance with the Manual on Uniform Traffic Control Devices for Streets and Highways 2009 or as amended.
7. PROTECTION OF WORK: It shall be the responsibility of the Contractor to keep the construction area properly guarded both day and night against vandalism, etc. Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness or any other cause, found to exist prior to the acceptance of the project, shall be removed immediately and replaced in an acceptable manner by the Contractor at his sole expense. **Sections of concrete which have been vandalized with graffiti, footprints, bicycle tracks, etc. must be removed and replaced: grinding and/or patching are not acceptable methods of repair.**
8. It shall be the responsibility of the Contractor to maintain access and egress to all entrances to establishments in the work area.
9. The Contractor shall be responsible for maintaining all existing road pavements, driveways, curbing, sidewalks, fencing, lawns, and other structures which may be affected by the Contractor's access to or work in the project area. Damaged facilities shall be promptly repaired by proper means with proper materials at the Contractor's expense.
10. Whenever heavy equipment interferes with or is likely to interfere with local vehicular traffic,

competent flagmen with safety vest shall be provided for traffic control. If it is necessary to close a street to vehicular traffic for a portion of the work, the Police and Fire Departments, Board of Education, Rescue Squad and Ambulance Services, and City of Vineland Division of Solid Waste Management must be notified at least two days (48 hours) in advance.

11. **In the event that work is performed outside normal working hours, on weekend days, or City Holidays, the Contractor will be responsible for paying overtime wages for any inspections, etc. done by the City forces during this time.**
- a. Rates for overtime inspection costs shall be provided to the Contractor upon request to perform work outside of the normal working hours, and approval by the City Engineer for such work to be performed.
 - b. The cost of overtime inspection will be deducted from any payments owed to the Contractor.
 - c. City Holidays are:
 - i. New Year's Day
 - ii. Martin Luther King Jr. Day
 - iii. Presidents' Day
 - iv. Good Friday
 - v. Memorial Day
 - vi. Juneteenth
 - vii. Independence Day
 - viii. Labor Day
 - ix. Columbus Day
 - x. Election Day
 - xi. Veterans Day
 - xii. Thanksgiving Day
 - xiii. Day after Thanksgiving
 - xiv. Christmas Day
12. **CONCRETING IN COLD WEATHER:** Concrete shall not be mixed and placed when the atmospheric temperature is at or below 40 Fahrenheit, except with the written approval of the Engineer. If such approval is given, the Engineer may prescribe the manner in which the work shall be done. All additional work in connection with concreting in cold weather shall be performed by the Contractor without specific or additional payment thereof.
13. **UTILITIES:** The Contractor shall be responsible for protecting existing utilities during all stages of work. Utility poles required to be braced or shored due to close proximity of the work, shall be braced or shored in accordance with the requirements of the utility involved. Separate payment will not be made for protection and preservation of utilities nor for cooperation with their owners. The bidder shall include all such costs in the unit prices bid for the various items of the Contract as listed in the Proposal. The Contractor shall have no claim for extra money for time lost due to utility relocation. The contractor shall coordinate all work and verify all facilities locations with all the utilities as listed.

LIST OF UTILITIES

City of Vineland
Electric Utility
640 East Wood St.
Vineland, NJ 08360

City of Vineland
Water/Sewer Utility
330 East Walnut Rd.
Vineland, NJ 08360

Comcast
1846 N. W. Boulevard
Vineland, NJ 08360

South Jersey Gas Co.
1211 N. Second St.
Millville, NJ 08332

Verizon
10 Tansboro Road, 2nd
Floor
Berlin, NJ 08009

Landis Sewerage Auth.
1776 S. Mill Rd.
Vineland, NJ 08360

Any or all of the utilities listed may be situated in the project area.

14. EQUIPMENT AND MATERIAL STORAGE: Any areas which are to be used for storage of gravel, topsoil, equipment, etc. must have authorization for use of private property. **This authorization is the responsibility of the Contractor. The Contractor shall supply copies of all such agreements to the Engineer prior to use of said premises.**
15. Work done contrary to the instructions of the Engineer, work done beyond the lines shown on the plans, except as herein specified or any extra work done without authority will be considered as unauthorized work and will not be paid for under the provisions of the Contract. Work so done may be ordered to be removed or replaced at the Contractor's expense. Upon failure on the part of the Contractor to comply forthwith any order of the Engineer made under these provisions, the Engineer will have authority to cause unacceptable work to be remedied or removed and replaced and unauthorized work to be removed and to deduct the costs thereof from any payment due the Contractor.
16. The Contractor shall notify the owners of properties adjoining the work area at least 48 hours prior to the time he proposes to begin any work which will interfere with their normal passage.
17. Locations of existing Utilities: Determining the location of all underground structures which may be encountered during the course of construction is the responsibility of the Contractor. The location of the existing utilities as indicated on the Contract Plans are approximate and used for general guidance and shall be verified by the Contractor. The costs such determinations shall be borne by the Contractor and shall be included in the price bid for the items specified in this proposal.
18. DIRT AND DUST CONTROL: The Contractor shall employ construction methods and means that will keep flying dust to the minimum. He shall provide for the laying of water on the Project, and on streets and other areas immediately adjacent to the Project limits, wherever traffic, or buildings that are occupied or in use are affected by such dust caused by his hauling or other operations. The materials and methods used for the water laying shall be subject to the approval of the Engineer. The cost of carrying the foregoing provisions shall be incidental to and included in the prices bid for the various items in the contract. The Contractor shall provide for the prompt removal from existing roadways of all dirt and other materials that have been spilled, washed, tracked or otherwise deposited thereon by his hauling and other operations whenever the accumulation is sufficient to cause the formation of mud, interfere with drainage, damage pavement or create a traffic hazard.

19. Time of Completion:

- a. Time of Substantial Completion will be **60 Calendar Days** after the date stipulated on the Contractor's Notice To Proceed.
- b. Time of Final Completion will be **75 Calendar Days** after the date stipulated on the Contractor's Notice To Proceed.

Substantial Completion shall be considered to be achieved after the completion of paving, striping and regulatory signage on projects including those work categories.

20. Maintenance Bond: At the completion of the Contract, a Maintenance Bond, which will be held for a period of 2 years, must be supplied for the amount of 100% of the total contract. Upon receipt of this bond, the 2% retainage will be released, as per the City Engineer's Discretion.

DETAILED SPECIFICATIONS

PROJECT SITE

The Project Site consists of Block 2232, Lots 18, 19, 20 & 21 with an area of 259,870.6 square feet (5.97± acres) with frontage along W. Park Avenue and N. West Avenue, these areas being in the City of Vineland, County of Cumberland, State of New Jersey, all as shown on the Contract Plans.

SCHEDULE OF DRAWINGS

Sheet Number	Sheet Title	Drawing Date	Latest Revision Date
1	Construction Plan	04/14/2026	

SCOPE OF WORK

The intent of this Contract is to provide for the construction and completion in every detail of work described. The Contractor shall furnish all labor, materials, equipment and transportation necessary to complete the work in accordance with the plans and specifications.

Lines and grades will be the responsibility of the Contractor. Sufficient benchmarks have been provided on the contract plans to perform the work in this proposal.

The work of this project shall include, but not be limited to, construction of Public Works Facility Buildings along with associated site, stormwater, utility, landscaping, lighting, and soil erosion measures as shown on the Contract Plans.

CONSTRUCTION LAYOUT

The contractor shall be responsible for all construction layout.

MAINTENANCE AND PROTECTION OF TRAFFIC

The Contractor is responsible for maintaining traffic accessibility at all times to respective homes, businesses and streets. Prior to the start of work on any street within the Contract Limits, the Police and Fire Department, Board of Education, Rescue Squad and Ambulance Services, and City of Vineland Division of Solid Waste Management must be notified at least two days (48 hours) in advance.

Traffic Control plans, and detour plans if applicable, are included within these contract documents. The Contractor shall submit a work schedule to the Engineer for approval prior to the beginning of any construction under this contract. The Contractor shall supply the Engineer with a list of people, representing the Contractor at a supervisory level, and their telephone numbers; any one of which shall be available, via telephone, on a 24 hours a day seven days a week basis to handle any emergency situations that may arise throughout the extent of this contract.

SECTION 1 - TRAFFIC CONTROL

This work shall consist of the planning for and the carrying out of maintenance and protection of vehicular and/or pedestrian traffic and to provide for the safe and convenient passage of such traffic, within the scope of this project. Maintenance and protection of traffic includes furnishing, assembling, placing, and relocating traffic control devices, including temporary pavement markers, and removing them when they are no longer required.

All items for Traffic Control shall be in accordance with Section 159 of the NJDOT Standard Specifications for Road and Bridge Construction 2019 or as amended.

Traffic Control plans are not in the plan set. The Contractor shall be responsible to provide Traffic Control Plans to the Engineer for review and approval. Plans may include signage for anticipated detours that may be required. There will be times, particularly at intersections, where the Contractor will need to prohibit traffic from entering from the side streets. At these times, the Contractor shall establish and maintain detours throughout the performance of that work so that vehicular traffic may be rerouted around and prevented from entering those work areas. Approval of the Engineer and consent of the local authorities having jurisdiction shall first be obtained for rerouting traffic over detours that are not shown on the plans. All necessary arrangements shall be made with such authorities regarding the establishment, maintenance, and repair of such detours, the regulation and direction of traffic thereon, and signing. Adequate directional and detour signs, acceptable to the local authorities, shall be furnished and erected at the locations where such authorities may direct and shall be in accordance with the MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS, 2009 or as amended. All work in connection with such detours shall be at no cost to the City. At times when the detour may not be in effect, all signs associated with the detour shall be covered or removed. All signs shown on the Traffic Control Plan shall remain uncovered for the duration of the Project.

Contract quantities for Traffic Control items are estimations only and are not necessarily required to be utilized by the Contractor.

During paving operations, traffic shall be prevented from entering onto the fresh pavement until it has been compacted and cooled enough to safely support traffic without rutting or other damage resulting. **The Contractor shall notify, a minimum of 48 hours (72 hours for NJ Transit) in advance of closing the roadway to thru traffic, the following entities:**

Local Residences and Businesses in the Affected Areas

Vineland Engineering Department	856-794-4090
Vineland Police Department	856-794-4000 ext 4191
Vineland Fire Department	856-794-4000 ext 4217
Vineland Emergency Medical Services	856-794-4000 ext 4624
Vineland Board of Education (Bus Transportation)	856-794-6700 ext 2222
Department of Public Works – Solid Waste Division	856-794-4000 ext 4612
New Jersey Transit (24 hrs/7 days/week)	973-378-6511

AT NO TIME SHALL ANY ROADWAY SECTION OR INTERSECTION BE CLOSED TO THROUGH TRAFFIC DURING NIGHT TIME HOURS, EXCEPT IN THE EVENT OF UNAVOIDABLE EMERGENCY SITUATIONS. IF AN UNAVOIDABLE EMERGENCY SITUATION ARISES, THE POLICE DEPARTMENT AND THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY TO VERIFY THE SITUATION AND APPROVE THE ROAD CLOSURE.

Traffic Control Devices shall be in good condition at the time of placement and shall be maintained in good condition until such time as they are no longer required for the project, at which time they will be removed by the Contractor.

1.1.1 TRAFFIC CONTROL, COMPLETE

Any items required for traffic control measures shall be furnished and installed in accordance with Section 159 of the NJDOT Standard Specifications for Road and Bridge Construction 2019 or as amended. Signs shown on the Traffic Control Plan shall be permanently installed on sign posts.

Temporary Pedestrian Ramp shall be furnished and installed to ensure that accessible routes are maintained during the construction project. Any materials used for "Temporary Pedestrian Ramps" shall be of durable material a minimum of 60" wide. The devices shall be installed such that the slope from the top of curb to the roadway is not less than 1:12. The devices will be fastened securely in place such that regular use during the time in service will not result in a gap between the curb and the device.

Temporary pedestrian paths from existing sidewalk to the Temporary Pedestrian Ramps shall be incidental to and included in the lump sum bid for this pay item. Use of "Temporary Pedestrian Ramps" shall be permitted at the discretion of the City Engineer, after review and approval of appropriate submittals.

SECTION 2 - CLEARING SITE

2.1.1 CLEARING SITE

Clearing site shall include, but not be limited to, removal of all vegetation, including tree roots, utility service boxes, water supply services, irrigation lines, all in the direct path of the work and the removal and relocation of signs, mailboxes or other obstacles which interfere with the specified work as shown on the Contract Plans. This item also **includes** the **relocation and resetting** of mailboxes, signs, irrigation lines and landscape timbers that may be required as a result of drainage construction, a new roadway alignment, or other construction, **(for example, an undisturbed mailbox that needs to be set closer to the roadway)**. This item shall also include the removal of any asphalt areas necessary for the placement of concrete sidewalks and driveways as specified in the Contract Plans, and shall be incidental to and included in the unit price bid for CLEARING SITE.

All work done under this item shall conform to Section 201-CLEARING SITE of the NJDOT Standard Specifications for Road and Bridge Construction 2019, as amended. The scraping, storing and reshaping of existing topsoil needed for restoration along the work area will be incidental.

SECTION 3 - CONCRETE REMOVAL AND CONSTRUCTION

3.1.1 CONCRETE PAD, 4" THICK

3.1.2 CONCRETE, HEAVY DUTY, REINFORCED, 8" THICK

This work shall consist of the construction of concrete sidewalks, driveways, and pads at the locations specified and conforming to the lines, grades and thickness specified in the Contract Plans. **Reinforced sidewalk, driveways, and pads, 6" and 8" thick shall be constructed with welded wire fabric reinforcement.** Any excavation, fill, DGA subbase, other work or materials needed to complete these items as shown on the Contract Plans shall be incidental to and included in the price bid for these items.

At no time shall a driveway be excavated that cannot be completed in the same workday. If a case occurs that the driveway cannot be completed, the driveway shall be made traversable through the use of compacted fill, steel plates, or other means as approved by the Engineer.

All work done under these items shall conform to Section 606.03.02– CONCRETE SIDEWALKS, DRIVEWAYS, AND ISLANDS, of the NJDOT Standard Specifications for Road and Bridge Construction 2019, as amended.

All work done under this item shall conform to **PUBLIC LAW 40A:11-18, AMERICAN GOODS AND PRODUCTS USE.**

Concrete sidewalk shall be constructed of Class B Concrete in sections having uniform lengths of 20 feet. The surface on which the sidewalk is to be placed shall be compacted prior to placing the concrete. The sidewalk shall have a minimum cross slope of 1/4 inch per foot sloping towards the street. The concrete shall be struck off with a transverse template resting upon the side forms. After the concrete has been struck off to the required cross section, it shall be finished with floats and straightedges until the required surface requirements have been obtained.

When the surface of the concrete is free from water and just before the concrete obtains its final set, it shall be gone over and finished with a wooden float and brushed with a wet soft-haired brush or as directed. The surface of the concrete shall be finished as to drain completely at all times. All edges shall be finished and rounded with an edging tool having a radius of 1/4 inch.

The surface shall be divided into blocks by use of a 1/4 inch wide grooving tool. Grooves shall be evenly spaced (4 foot min. to 6 foot max.) so as to cause expansion joints to be placed at a groove line. The grooves shall be cut to a minimum depth of 1/4 the sidewalk thickness and shall be not less than 1 inch deep. The edges of the grooves shall be edged with an edging tool having a radius of 1/4 inch.

Expansion joints shall be 1/2 inch wide, placed at intervals of approximately 20 feet and shall be filled with preformed expansion joint filler. Expansion joints shall be formed around all appurtenances such as manholes and utility poles extending into or through the concrete. Preformed expansion joint filler, 1/4 inch thick, shall be installed in these joints. Expansion joint filler shall be installed in the concrete where it meets any fixed structure, such as a building or bridge. This expansion joint filler shall be the full depth of the concrete.

The tops and ends of expansion joints shall be cleaned of concrete, and the expansion joint material shall be so trimmed as to be slightly below the surface of the concrete.

Should roof drain leaders be encountered during the course of construction, the same shall be protected from damage. Any damaged roof drain leaders shall be replaced as directed by the Engineer and shall be incidental to, and included in the cost of this item.

SECTION 4 - PIPES, STRUCTURES & CASTINGS

4.1 POLYVINYL CHLORIDE (PVC) PIPE

4.1.1 4" DIA. POLYVINYL CHLORIDE (PVC) SANITARY SEWER PIPE

4.1.2 6" DIA. POLYVINYL CHLORIDE (PVC) DRAINAGE PIPE

This item refers to the supply and installation of polyvinyl chloride (PVC) pipes of the sizes specified and conforming to the lines and grades specified in the Contract Plans.

Any excavation, fill, other work or materials needed to complete this item shall be incidental to and included in the unit price bid for these items. Any connections to existing sanitary and/or drainage systems and clean-outs as shown on the Contract Plans shall be incidental to and included in the unit price bid for these items.

Construction requirements for these items shall conform to Subsection 601 - PIPE of the NJDOT Standard Specifications for Road and Bridge Construction 2019, as amended. Construction requirements for sanitary sewer piping shall also conform to all applicable Landis Sewerage Authority standards.

Backfill shall be made with excavated material or selected borrow material that meets the approval of the Engineer. Backfill shall be compacted and meet the requirements of Subsection 203.03.B.4 of the NJDOT Standard Specifications for Road and Bridge Construction 2019, as amended.

Under this item the contractor shall install temporary pavement consisting of a wearing course of two (2) inches of Hot Mix Asphalt (HMA) on the compacted backfill material. The HMA shall be placed in one (1) lift and shall be rolled and compacted in accordance with section 401 – HOT MIX ASPHALT (HMA) COURSES of the NJDOT Standard Specifications for Road and Bridge Construction 2019, as amended.

By the end of each construction day, all backfilled trenches shall have temporary pavement installed.

The Contractor is required to maintain the proper grade of the temporary pavement during the entire duration of its existence. If depressions, ripples, potholes or washouts should occur, the contractor shall be required to fill in and compact, or otherwise repair the surface, at no additional cost to the City, so that a true and uniform grade exists at the level of the existing undisturbed surface.

Immediately after backfill and compaction of the trench and prior to placement of the temporary pavement, all excess excavated material shall be removed from the street. All areas outside the trench area, including shoulder, curb and gutter, sidewalk area and private property shall be swept and/or washed clean of any dirt or debris, placed there or caused to have accumulated due to the Contractor's operation. Care shall be taken so that none of this excess material or debris gets into any of the new or existing pipes or structures.

Temporary pavement restoration shall be incidental to and included.

All work done under this item shall conform to Section 601 - PIPE of the NJDOT Standard

Specifications for Road and Bridge Construction 2019, as amended. The sanitary sewer pipe shall conform to ASTM D3034 Type PSM Poly(Vinyl Chloride)(PVC) Sewer Pipe and Fittings. The drainage pipe shall conform to AASHTO M-304 Poly(Vinyl Chloride)(PVC) Profile Wall Drain Pipe and Fittings.

All work done under this item shall conform to **PUBLIC LAW 40A:11-18, AMERICAN GOODS AND PRODUCTS USE.**

SECTION 5 – ROADWAY EXCAVATION, SAWCUTTING

5.1.1 SAWCUTTING (HMA)

Sawcutting (HMA) shall consist of the sawcutting of existing HMA pavement at the areas specified in the Contract Plans, or as directed by the Engineer to allow for a neat and clean edge for the construction of HMA match points. The saw shall be capable of providing a neat cut the full depth in a single pass.

SECTION 6 – DENSE GRADED AGGREGATE

6.1.1 DENSE GRADED AGGREGATE BASE COURSE, VARIABLE THICKNESS

This work shall consist of the furnishing, placing, grading and compaction of one or more courses of dense graded aggregate on a prepared surface, conforming to the lines, grades, thickness, and cross-sections as shown on the Contract Plans or as directed by the Engineer. Composition of crushed concrete with other materials shall be consistent with Subsection 901.10 of the NJDOT Standard Specifications for Road and Bridge Construction 2019, as amended.

All work done under this item shall conform to Sections 302- AGGREGATE BASE COURSE of the NJDOT Standard Specifications for Road and Bridge Construction 2019, as amended.

SECTION 7 – HOT MIX ASPHALT & SURFACE TREATMENTS

7.1 HOT MIX ASPHALT (HMA)

7.1.1 HOT MIX ASPHALT 19M64 BASE COURSE

7.1.2 HOT MIX ASPHALT 9.5M64 SURFACE COURSE

Items 7.1.1 and 7.1.2 shall consist of the furnishing and placement of hot mix asphalt base course, including any required tack coat, at the locations specified, conforming to the lines, grades, thickness and cross-sections specified in the Contract Plans. Tack coat shall be incidental to this item.

All work done under items 7.1.1 and 7.1.2 shall conform to Section 902 – ASPHALT of the NJDOT Standard Specifications for Road and Bridge Construction 2019, as amended.

SECTION 8 - LANDSCAPING

8.1.1 TOPSOILING, 4" THICK

This work shall consist of the preparation and placement of topsoil stripped from the project site and the furnishing, preparation and placement of topsoil in excess of that material obtained from stripping conforming to the lines, grades and typical cross-sections specified in the Contract Plans.

All work done under this item shall conform to Section 804 - TOPSOILING of the NJDOT Standard Specifications for Road and Bridge Construction 2019, as amended. All stones, 1 ½ inches or larger in any dimension, and other debris such as wires, cables, tree roots, pieces of concrete, clods, and lumps shall be removed and the surface scarified to provide an improved bond between the slope and topsoil.

8.2.1 FERTILIZING AND SEEDING, TYPE A

This work shall consist of the preparation of the seedbed, furnishing and placing of seed mixtures, grain seed, pulverized limestone and fertilizer at the locations specified in the Contract Plans. Any work or materials needed to complete this item shall be incidental to and included in the unit price bid for this item.

All work done under this item shall conform to Section 806 - FERTILIZING AND SEEDING of the NJDOT Standard Specifications for Road and Bridge Construction 2019, as amended.

Materials shall be obtained from a dealer or manufacturer whose products are shown by analysis to fulfill the guarantee claimed by the producer.

8.3.1 STRAW MULCHING

This work shall consist of to the supply, application and binding of straw mulch to stabilize and protect the areas that have been seeded. Any work and materials needed to complete this item shall be incidental to and included in the unit price bid for this item.

All work done under this item shall conform to section 809 - MULCHING of the NJDOT Standard Specifications for Road and Bridge Construction 2019, as amended.

SECTION 9 - EARTHWORK

9.1.1 SITE GRADING

This work shall consist of the rough and fine grading of the site conforming to the lines, grades, thickness and cross-sections specified in the Contract Plans or as directed by the Engineer.

Materials and Methods of Construction

For setting and establishing finish elevations and lines, contractor shall secure the services of a licensed land surveyor. Contractor shall provide elevation grade stakes and any other surveying necessary for the layout of the work. The work shall be conducted in such a manner that the survey stakes will be protected as long as their need exists. Grade stakes which are damaged or stolen, shall be replaced by contractor's surveyor at contractor's expense.

Graded areas shall be uniform, hard and smooth, free from rock, debris, or irregular surface changes. Finished subgrade surface shall not be more than 0.10 feet above or below the design finished subgrade elevation; any deviation shall not result in changes in drainage areas or ponding. All ground surfaces shall vary uniformly between indicated elevations. Graded areas shall also be protected from compaction unless the site is specifically called upon for a designed compaction level.

Areas having drainage slopes of one-quarter inch per foot or more shall have grade stakes, set with an instrument, at grid intervals of fifty (50) feet. Areas having drainage slopes of one-quarter inch per foot or less shall have grade stakes, set with an instrument, at grid intervals of twenty-five (25) feet. Graded areas shall be temporarily and permanently stabilized in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey, Chapter 251.

ON-SITE FILL

The reuse of on-site fill shall be evaluated by the Project Engineer. Material containing rock, stone or masonry debris greater than 4-inches in its largest dimension is unacceptable as backfill for pavement or building subgrade elevation. On-site fill shall not be reused if the fill contains organics, timber, steel, brick, refuse, and other debris. Excavated on-site fill containing deleterious materials, debris, and other materials deemed geotechnically unsuitable for reuse as on-site fill by the Project Engineer or Manager shall be segregated from usable material and disposed of off-site in accordance with all applicable regulations.

OFF-SITE IMPORTED FILL

Off-site fill (when required) shall be clean, well graded granular soil which is non-expansive and non-collapsible and shall have less than 15% by weight passing the #200 sieve. The portion passing the #200 sieve shall be non-plastic. Off-site fill shall be free of organics and other deleterious materials. A sample of any off-site fill material shall be provided to the Municipality along with laboratory testing results and a certificate of clean fill. Approval of off-site fill material shall be obtained from the Project Engineer or Project Manager prior to delivery of any proposed imported fill to the site.

Imported fill shall be free of all hazardous substances as listed by the New Jersey Department of Environmental Protection in New Jersey Administrative Code, Title 7; Chapter 1E, Appendix A. Certification of compliance and test results substantiating compliance shall be furnished to the Municipality by the Contractor not less than two weeks prior to its delivery to the site and intended use. The City of Vineland reserves the right to test off-site fill material for conformance with these design standards on campus or at the fill site.

All work done under this item shall conform to Section 200 – EARTHWORK of the NJDOT Standard Specifications for Road and Bridge Construction 2019, and as amended.

SECTION 10 – MISCELLANEOUS SITE IMPROVEMENTS

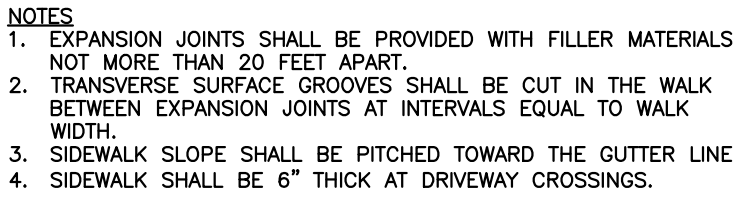
10.1.1 BOLLARDS

This item refers to the supply, setting and installation of bollards conforming to the lines, types, height and locations specified in the Contract Plans. Construction details for this item are shown on the Construction Details of the Contract Plans. Any clearing, excavation, other work or material, including concrete, needed to complete this item shall be incidental to this item.

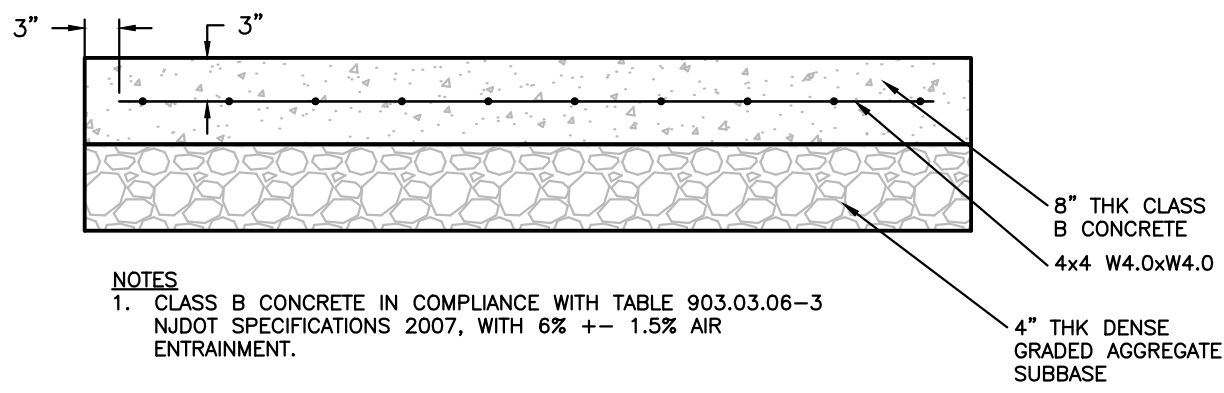


1. THE LOCATIONS OF UTILITIES SHOWN ON THIS PLAN ARE NOT NECESSARILY COMPLETE. THE CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES OPERATING WITHIN THE CONSTRUCTION AREA TO VERIFY THE LOCATIONS, SIZE, TYPE, AND ELEVATIONS OF ANY UTILITIES PRIOR TO COMMENCEMENT OF DEMOLITION.
2. THE CONTRACTOR SHALL VERIFY THE LOCATION AND THE DEPTH OF ALL EXISTING UTILITIES UNDERGROUND PER THE UNDERGROUND FACILITY PROTECTION ACT, BETTER KNOWN AS THE "ONE CALL LAW," OCTOBER 1994. THIS LAW REQUIRES THAT ANYONE DIGGING MUST CALL 1-800-272-1000 OR 811, 72 HOURS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION OR DEMOLITION SO THAT OPERATORS CAN MARK OUT THEIR UNDERGROUND UTILITIES IN ACCORDANCE WITH APPLICABLE LAWS, RULES AND REGULATIONS.
3. THE LOCATIONS AND DEPTHS OF EXISTING UTILITIES AS SHOWN ON THE PLANS ARE APPROXIMATE AND SHOULD BE RELIED UPON BY THE CONTRACTOR. THE CONTRACTOR SHALL CHECK AND VERIFY THE LOCATION OF ALL UTILITIES, BOTH UNDERGROUND, ABOVE GROUND AND OVERHEAD, BEFORE THE ORDERING OF MATERIALS OR COMMENCEMENT OF CONSTRUCTION.
4. THE CONTRACTOR SHALL PROTECT ALL STRUCTURES AND OBJECTS THAT ARE TO REMAIN SO AS TO AVOID DAMAGE DUE TO DEMOLITION ACTIVITIES.
5. NO DISTURBANCES NOR PLACEMENT OF MATERIALS SHALL BE PERMITTED BEYOND THE PROJECT PROPERTY LINES WITHOUT THE WRITTEN CONSENT OF THE PROPERTY OWNER(S) INVOLVED. ANY AND ALL DAMAGE CAUSED TO ADJACENT FACILITIES BY DEMOLITION OPERATIONS AND/OR STORAGE OF MATERIALS OR EQUIPMENT SHALL BE PROMPTLY REPAIRED AT NO COST TO THE OWNER.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING PAVING AND CONCRETE, AS WELL AS TOPSOILING, SODDING, FERTILIZING AND SEEDING ALL AREAS DISTURBED BY HIS ACTIVITIES. ROAD PAVEMENT REPLACEMENT AND ALL RESTORATION IN STATE ROADS SHALL MEET THE REQUIREMENTS OF THE STATE ENGINEER.
7. THE USE OF EXPLOSIVES FOR DEMOLITION WILL NOT BE PERMITTED.
8. THE CONTRACTOR SHALL CONDUCT DEMOLITION OPERATIONS AND REMOVAL OF DEBRIS TO ENSURE MINIMAL INTERFERENCE WITH ROADS, WALKS, AND OTHER ADJACENT OCCUPIED OR USED FACILITIES.
9. ALL DEBRIS, RUBBISH, HAZARDOUS WASTE, AND OTHER MATERIALS RESULTING FROM DEMOLITION OPERATIONS AND/OR FOUND ON THE SITE DURING DEMOLITION OR CONSTRUCTION, SHALL BE REMOVED FROM THE SITE AND DISPOSED OF IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL REGULATION.
10. IN LOCATIONS WHERE CONCRETE AND PAVEMENT, TO BE REMOVED, ABUT SURFACES OF LIKE MATERIALS, THE CONCRETE AND PAVEMENT SHALL BE SAW CUT ALONG THE LIMITS OF REMOVAL TO LEAVE A CLEAN, EVEN EDGE REMAINING WHERE SUCH MATERIALS ARE TO REMAIN IN PLACE. AT ALL LOCATIONS WHERE EXISTING BUILDINGS AND FOUNDATIONS ARE TO BE REMOVED, THE EXPOSED SUBGRADE SHALL BE PROOF ROLLED AND DENSIFIED WITH A 15 TON SELF-PROPELLED VIBRATORY COMPACTOR. THE DENSITY OF 95% OF MODIFIED PROCTOR SHALL BE ACHIEVED PRIOR TO ANY PROPOSED CONSTRUCTION.
11. THE OWNER OR HIS REPRESENTATIVE IS TO DESIGNATE AN INDIVIDUAL RESPONSIBLE FOR CONSTRUCTION SITE SAFETY DURING THE COURSE OF SITE IMPROVEMENTS PURSUANT TO N.J.A.C. 5:23-2.21 (e) OF THE N.J. UNIFORM CONSTRUCTION CODE AND CFR 1926.32 (f) (OSHA COMPETENT PERSON)
12. THE INSPECTION OF, OR FAILURE TO INSPECT, ANY MATERIALS OR WORKMANSHIP BY STATE, COUNTY, OR CITY OFFICIALS SHALL IN NO WAY RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITIES TO PERFORM THE WORK IN ACCORDANCE WITH APPLICABLE PLANS, SPECIFICATIONS, AND LAWS.

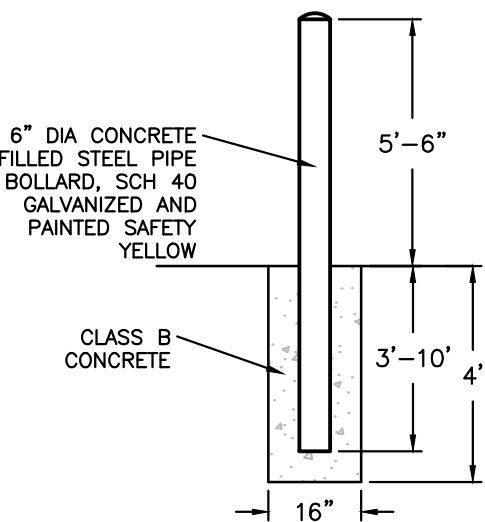
1. LIGHTWEIGHT CONSTRUCTION EQUIPMENT SHALL BE USED IN LAWN AREAS.
2. ANY SOIL BROUGHT ON TO THE SITE, INCLUDING TOPSOIL AND OTHER FILL SOIL, MUST BE CERTIFIED CLEAN SOIL.
3. ROOF DOWNSPOUTS SHALL DRAIN TO STORMWATER DRAINAGE SYSTEM, AS NOTED.
4. ALL BUILDING ROOF LEADERS SHALL BE DIRECTED IN THE PROPER LOCATION IN ACCORDANCE WITH THE DRAINAGE PLANS.
5. THE FOUNDATION FOR EACH BUILDING SHALL BE CONSTRUCTED PER THE MANUFACTURER'S RECOMMENDATIONS.



NTS



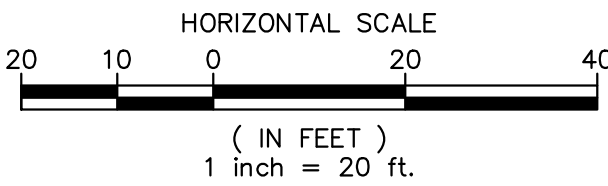
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NTS

1. PROPERTY IN QUESTION KNOWN AS: TAX MAP SHEET NO. 22, BLOCK 2232, LOTS 18, 19, 20 & 21, AS SHOWN ON THE OFFICIAL TAX MAP OF THE CITY OF VINELAND, CUMBERLAND COUNTY, NEW JERSEY.
2. PROPERTY IN QUESTION CONTAINS: 259,870.6 SQUARE FEET (5.965 AC). ENTIRE LOT DEVELOPABLE.
3. PROPERTY IN QUESTION IS ZONED: B-2 – BUSINESS ZONE [GOVERNMENTAL FACILITY]
4. OWNER/APPLICANT:
CITY OF VINELAND
640 E. WOOD STREET
VINELAND, NEW JERSEY 08362

PREPARED BY:
DIVISION OF PLANNING AND FACILITIES
640 E. WOOD STREET
VINELAND, NEW JERSEY 08362
5. PRESENT LAND USE: PUBLIC WORKS YARD
PROPOSED LAND USE: GOVERNMENT FACILITY
6. BOUNDARY AND TOPOGRAPHY IS BASED UPON PLAN ENTITLED, "PLAN OF SURVEY AND TOPOGRAPHY", PREPARED BY CONSULTING ENGINEER SERVICES, DATED 06/20/2023.
7. FIELD INSPECTION AND LOCATIONS PERFORMED BY CITY OF VINELAND IN APRIL 2026.
8. NO WETLANDS ARE PRESENT ON-SITE AS SHOWN ON NJ GEO-WEB.
9. THE SITE IS LOCATED OUTSIDE OF THE FLOOD PLAIN ZONE PER FEMA, CITY OF VINELAND, CUMBERLAND COUNTY, NEW JERSEY, PANEL NUMBER 34011C0185E, DATED JUNE 16, 2016.
10. VERTICAL DATUM IS BASED UPON NAVD 88.
HORIZONTAL DATUM IS BASED ON NJSPC NAD 83 (2011).
11. THE OWNER OR HIS REPRESENTATIVE IS TO DESIGNATE AN INDIVIDUAL RESPONSIBLE FOR CONSTRUCTION SITE SAFETY DURING THE COURSE OF SITE IMPROVEMENTS PURSUANT TO N.J.A.C. 5:23-2.21(e) OF THE N.J. UNIFORM CONSTRUCTION CODE AND OFR 1926.32(f)(1) (OSHA COMPETENT PERSON).
12. THE CONTRACTOR SHALL VERIFY THE LOCATION AND THE DEPTH OF ALL EXISTING UTILITIES UNDERGROUND PER THE UNDERGROUND FACILITY PROTECTION ACT, BETTER KNOWN AS THE "ONE CALL" LAW, OCTOBER 1994. THIS LAW REQUIRES THAT ANYONE DIGGING MUST CALL 1-800-477-1000 OR 811, 72 HOURS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION OR DEMOLITION SO THAT OPERATORS CAN MARK OUT THEIR UNDERGROUND UTILITIES IN ACCORDANCE WITH APPLICABLE LAWS, RULES, AND REGULATIONS.
13. EXISTING CITY OF VINELAND MONUMENTS SHALL BE PRESERVED TO THE GREATEST EXTENT PRACTICABLE. SHOULD THE MONUMENTATION BE DAMAGED OR DESTROYED, THE RESPONSIBLE PARTY SHALL REIMBURSE THE CITY OF VINELAND FOR THE REPLACEMENT OF SAID MONUMENTATION.
14. PER N.J.S.A. 40A:11-18, ONLY MANUFACTURED PRODUCTS OF THE UNITED STATES, WHEREVER AVAILABLE, SHALL BE USED FOR WORK WHICH THE CITY OF VINELAND OR ANY OTHER GOVERNMENTAL AGENCY SHALL ULTIMATELY OWN AND MAINTAIN.



				DATE	
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			BY		
			REVISIONS		

CITY OF VINELAND

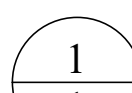
PUBLIC WORKS FACILITY
 PLATE 22, BLOCK 2232, LOTS 18, 19, 20 & 21
 CITY OF VINELAND, CUMBERLAND COUNTY, NEW JERSEY

COUNTY OF CUMBERLAND STATE OF NEW JERSEY

SCALE : 1"=20' DIVISION OF PLANNING AND FACILITIES DATE : 04/14/2026
 FILE # : DPF-2024-02 640 EAST WOOD STREET
 VINELAND, NEW JERSEY 08360




Ryan R. Headley
 Professional Engineer
 N.J. License No. 24GEO5211800



PHONE : (856) 794-4101 FAX : (856) 405-4606

DIVISION 3 – CONCRETE

032000	Concrete Reinforcing
033000	Cast-In-Place Concrete

DIVISION 6 - WOOD AND PLASTIC

061000	Rough Carpentry
064100	Custom Casework

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

072100	Thermal Insulation
072700	Firestopping
079000	Joint Sealers

DIVISION 8 - DOORS AND WINDOWS

081100	FRP Flush Doors and Aluminum Framing System
081110	Standard Steel Doors
081120	Standard Steel Frames
084100	Aluminum Entrances and Storefronts
087100	Door Hardware
088000	Glazing

DIVISION 9 - FINISHES

092600	Gypsum Board Systems
095110	Suspended Acoustical Ceilings
096500	Resilient Tile Flooring
096880	Carpet
099000	Painting

DIVISION 10 – SPECIALTIES

105220	Fire Extinguishers and Accessories
108000	Toilet Room Accessories

DIVISION 13 – SPECIAL CONSTRUCTION

133400	Engineered Post Frame Structures
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DIVISION 22 PLUMBING

220500	Common Work Results for Plumbing
220523	General-Duty Valves for Plumbing Piping
220529	Hangers and Supports for Plumbing Piping and Equipment
220553	Identification for Plumbing Piping and Equipment
220700	Plumbing Insulation
221116	Domestic Water Piping
221316	Sanitary Waste and Vent Piping
221319	Sanitary Waste and Vent Piping Specialties
224000	Plumbing Fixtures

DIVISION 23 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

230500	Common Work Results for HVAC
230553	Identification for HVAC Piping and Equipment
230593	Testing, Adjusting, and Balancing for HVAC
230700	HVAC Insulation
232113	HVAC Piping
233113	Metal Ducts
233300	Air Duct Accessories

NOTE:

DIVISION 23 - HVAC

**This work will be performed by the owner.
Successful contractor will need to coordinate
their work with the owner's workforce.
This information is supplied for information only.**

City of Vineland-Public Works Pole Barn – Table of Contents

233300	Flexible Ducts
233416	Centrifugal HVAC Fans
233713	Diffusers, Registers, and Grilles
235416	Split System Air Conditioners
238239	Cabinet Unit Heaters

DIVISION 26 ELECTRICAL

260500	Common Work Results for Electrical
260519	Low-Voltage Electrical Power Conductors and Cables
260526	Grounding and Bonding for Electrical Systems
260529	Hangers and Supports for Electrical Systems
260533	Raceway and Boxes for Electrical Systems
260536	Cable Trays for Electrical Systems
260543	Underground Ducts and Raceways for Electrical Systems
260553	Identification for Electrical Systems
260800	Electrical Systems Verification
260923	Lighting Control Devices
262416	Panelboards
262726	Wiring Devices
262813	Fuses
262816	Enclosed Switches and Circuit Breakers
262913	Enclosed Controllers for Electrical
265119	LED Lighting
265219	Exit Lighting

NOTE:

DIVISION 26 - ELECTRICAL

This work will be performed by the owner.

Successful contractor will need to coordinate their work with the owner's workforce.

This information is supplied for information only.

DIVISION 27 – COMMUNICATIONS

271100	Communications Equipment Room Fittings
271500	Communications Horizontal Cabling

NOTE:

DIVISION 27 - COMMUNICATIONS

This work will be performed by the owner.

Successful contractor will need to coordinate their work with the owner's workforce.

This information is supplied for information only.

Attachments

Technical Specifications for City of Vineland Public Works Facility 78 West Park Avenue dated October 8, 2024, prepared by City of Vineland Division of Planning and Facilities (36 Pages).

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.
 - 2. Reinforcing steel bars and accessories for concrete footings.

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Each type of steel reinforcement.
 - 2. Bar supports.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, **Grade 60 (Grade 420)**, deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- C. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.

2.2 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
 - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
- B. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch (1.2908 mm) in diameter.
 - 1. Finish: **Plain**.

2.3 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Do not cut or puncture vapor retarder.
 - 2. Repair damage and reseal vapor retarder before placing concrete.

SECTION 032000 - CONCRETE REINFORCING

- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
 - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - 2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1 inch (25 mm), not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318 (ACI 318M).
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Install welded-wire reinforcement in longest practicable lengths.
 - 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
 - a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches (305 mm).
 - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches (50 mm) for plain wire and 8 inches (200 mm) for deformed wire.
 - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
 - 4. Lace overlaps with wire.

3.3 INSTALLATION TOLERANCES

- A. Comply with ACI 117 (ACI 117M).

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- B. Inspections:
 - 1. Steel-reinforcement placement.
 - 2. Steel-reinforcement mechanical splice couplers.
 - 3. Steel-reinforcement welding.

END OF SECTION

SECTION 033000 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Foundation walls.
 - 3. Slabs-on-grade.
 - 4. Concrete toppings.
- B. Related Sections:
 - 1. Division 02 Section "Earthwork" for drainage fill under slabs-on-grade.
 - 2. Division 02 Section "Concrete Paving" for concrete pavement and walks.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
 - 1. The contractor shall deliver to the engineer, at the completion of the job, one (1) electronic version of the final field copies of all steel reinforcing shop drawings.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.

SECTION 033000 – CAST-IN-PLACE CONCRETE

- F. Samples: For waterstops and vapor retarder.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturer, and testing agency.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Fiber reinforcement.
 - 6. Waterstops.
 - 7. Curing compounds.
 - 8. Floor and slab treatments.
 - 9. Bonding agents.
 - 10. Adhesives.
 - 11. Vapor retarders.
 - 12. Semirigid joint filler.
 - 13. Joint-filler strips.
 - 14. Repair materials.
 - 15. Mechanical Splices.
- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- F. Field quality-control test and inspection reports.
- G. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

SECTION 033000 – CAST-IN-PLACE CONCRETE

2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
 - D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures through single source from single manufacturer.
 - E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D1.4M, "Structural Welding Code-Reinforcing Steel."
 - F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 1. ACI 301, "Specification for Structural Concrete."
 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
 3. ACI 216, "Guide for Determining Fire Endurance of Concrete Elements".
 - G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
 - H. Mockups: Cast concrete slab-on-grade and formed-surface panels as required by the Architect/owner to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.
 1. Build panel approximately 200 sq. ft. (18.6 sq. m) for slab-on-grade and 100 sq. ft. (9.3 sq. m) for formed surface in the location indicated or, if not indicated, as directed by Architect.
 2. Approved panels may become part of the completed Work if undisturbed at time of Substantial Completion.
 - I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - e. Special concrete finish subcontractor.
 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

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- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials. Utilize steel, glass-fiber-reinforced plastic, or other approved non-absorptive panel material that will provide continuous, true and smooth surfaces in all architectural concrete.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- D. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 (Grade 420) ASTM A 706/A 706M, deformed bars, assembled with clips.

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- E. Plain-Steel Wire: ASTM A 82 /A 82M.
- F. Deformed-Steel Wire: ASTM A 496/A 496M.
- G. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.
- H. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/ A 497M, flat sheet.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
- C. Mechanical Splices: For splicing reinforcing bars, splice material must conform with testing set forth in ASTM 1034/1034M, and shall develop in tension or compression, as required, at least 125% of the specified yield strength of the bar.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I, color as indicated on Architectural Contract documents. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class C or F.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
 - 2. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag
- B. Normal-Weight Aggregates: ASTM C 33, Class **3S** coarse aggregate or better, graded. Provide aggregates from a single source.
 - 1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

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2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 WATERSTOPS

- A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).
 1. Products: Subject to compliance with requirements, provide the following:
 - a. CETCO; Volclay Waterstop-RX.

2.7 VAPOR RETARDERS

- A. Sheet Vapor Retarder under slab-on-grade: ASTM E 1745, Class A, not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fortifiber Building Systems Group; Moistop Ultra 10.
 - b. Insulation Solutions, Inc.; Viper VaporCheck 10.
 - c. Meadows, W. R., Inc.; Perminator 10 mil.
 - d. Raven Industries Inc.; Vapor Block 10.
 - e. Stego Industries, LLC; Stego Wrap 10 mil Class A.

2.8 LIQUID FLOOR TREATMENTS

- A. VOC Content: Liquid floor treatments shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces. Floor treatment applies to the exposed loading dock slab.
 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. ChemMasters; Chemisil Plus.
 - b. ChemTec Int'l; ChemTec One.
 - c. Conspec by Dayton Superior; Intraseal.
 - d. Curecrete Distribution Inc.; Ashford Formula.
 - e. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).
 - f. Edoco by Dayton Superior; Titan Hard.
 - g. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
 - h. Kaufman Products, Inc.; SureHard.
 - i. L&M Construction Chemicals, Inc.; Seal Hard.
 - j. Meadows, W. R., Inc.; LIQUI-HARD.
 - k. Metalcrete Industries; Floorsaver.
 - l. Nox-Crete Products Group; Duro-Nox.
 - m. Symons by Dayton Superior; Buff Hard.
 - n. US SPEC, Division of US Mix Products Company; US SPEC Industraseal.
 - o. Vexcon Chemicals, Inc.; Vexcon StarSeal PS Clear.

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2.9 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
- a. Axim Italcementi Group, Inc.; CATExOL CimFilm.
 - b. BASF Construction Chemicals - Building Systems; Confilm.
 - c. ChemMasters; SprayFilm.
 - d. Conspec by Dayton Superior; Aquafilm.
 - e. Dayton Superior Corporation; Sure Film (J-74).
 - f. Edoco by Dayton Superior; BurkeFilm.
 - g. Euclid Chemical Company (The), an RPM company; Eucobar.
 - h. Kaufman Products, Inc.; Vapor-Aid.
 - i. Lambert Corporation; LAMBCO Skin.
 - j. L&M Construction Chemicals, Inc.; E-CON.
 - k. Meadows, W. R., Inc.; EVAPRE.
 - l. Metalcrete Industries; Waterhold.
 - m. Nox-Crete Products Group; MONOFILM.
 - n. Sika Corporation; SikaFilm.
 - o. SpecChem, LLC; Spec Film.
 - p. Symons by Dayton Superior; Finishing Aid.
 - q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
 - r. Unitex; PRO-FILM.
 - s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
- a. Anti-Hydro International, Inc.; AH Clear Cure WB.
 - b. BASF Construction Chemicals - Building Systems; Kure-N-Seal WB.
 - c. ChemMasters; Safe-Cure & Seal 20.
 - d. Conspec by Dayton Superior; Cure and Seal WB.
 - e. Cresset Chemical Company; Crete-Trete 309-VOC Cure & Seal.
 - f. Dayton Superior Corporation; Safe Cure and Seal (J-18).
 - g. Edoco by Dayton Superior; Spartan Cote WB II.
 - h. Euclid Chemical Company (The), an RPM company; Aqua Cure VOX; Clearseal WB 150.
 - i. Kaufman Products, Inc.; Cure & Seal 309 Emulsion.
 - j. Lambert Corporation; Glazecote Sealer-20.
 - k. L&M Construction Chemicals, Inc.; Dress & Seal WB.
 - l. Meadows, W. R., Inc.; Vocomp-20.
 - m. Metalcrete Industries; Metcure.

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- n. Nox-Crete Products Group; Cure & Seal 150E.
- o. Symons by Dayton Superior; Cure & Seal 18 Percent E.
- p. TK Products, Division of Sierra Corporation; TK-2519 WB.
- q. Vexcon Chemicals, Inc.; Starseal 309.

2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.022-inch- (0.55-mm-) thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.034 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.

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4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume may be used to reduce the total amount of portland cement. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 1. Fly Ash: 25 percent.
 2. Combined Fly Ash and Pozzolan: 25 percent.
 3. Ground Granulated Blast-Furnace Slag: 40 percent.
 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: As indicated on contract documents.
 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
 4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.
- B. Basement, Retaining, and Foundation Walls: Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: As indicated on contract documents.
 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
 4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size.

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- C. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: As indicated on contract documents.
 2. Minimum Cementitious Materials Content: 500 lb/cu. yd. (297 kg/cu. m).
 3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
 4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size for slabs exposed to freeze and thaw only.
 5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
- D. Suspended Slabs: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: As indicated on contract documents.
 2. Minimum Cementitious Materials Content: 500 lb/cu. yd. (297 kg/cu. m).
 3. Slump Limit: 4 inches (100 mm) plus or minus 1 inch (25 mm).
 4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size for slabs exposed to freeze and thaw only.
 5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
- E. Concrete Toppings: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: As indicated on contract documents.
 2. Minimum Cementitious Materials Content: 500 lb/cu. yd. (297 kg/cu. m).
 3. Slump Limit: 4 inches (100 mm) plus or minus 1 inch (25 mm).
 4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch (19-mm) nominal maximum aggregate size for slabs exposed to freeze and thaw only.
 5. Air Content: Do not allow air content of troweled finished toppings to exceed 3 percent.

2.14 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.15 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C116M, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION**3.1 FORMWORK**

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities per Architectural documents and designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch (6 mm) Class C, 1/2 inch (13 mm) for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

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1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

- A. Comply with ACI 318 (ACI 318M), ACI 347 and ACI 301 for design, installation, and removal of shoring and reshoring.
 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
 1. Lap joints 6 inches (150 mm) and seal with manufacturers recommended tape.

3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

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1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 1. Weld reinforcing bars according to AWS D1.4/D1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

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2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOPS

- A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

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- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view as indicated on Architectural documents.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete as indicated on Architectural documents.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
 3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

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- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in one direction.
 - 1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings and to receive mortar setting beds for bonded cementitious floor finishes and as indicated on Architectural documents.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated and to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo and as indicated on Architectural documents.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces indicated and exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system and as indicated on Architectural documents.
 - 2. Finish on-grade and supported surfaces to the applicable minimum following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface. The contractor shall supply floor leveling material and other corrective measures in areas where floor finish provisions exceed the flatness and levelness requirements. Per ACI 302.1R, F(L) requirements should only be applied to slabs-on-ground that are level and suspended slabs that are both level and shored.
 - a. For carpeted slabs, specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
 - b. For thin floor coverings, specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
 - c. For thin floor coverings, specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated and where ceramic or quarry tile is to be installed by either thickset or thin-set method and as indicated on Architectural documents. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

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- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- G. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate or aluminum granule finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
 - 1. Uniformly spread dampened slip-resistive aggregate or aluminum granules over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
 - 2. After broadcasting and tamping, apply float finish.
 - 3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate or aluminum granules.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

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E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 2. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

3.15 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

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1. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.16 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor

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- elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.
- 3.17 FIELD QUALITY CONTROL
- A. Except as otherwise indicated on drawings or specified herein, all work under this Section shall conform to applicable requirements of the local Building Code and regulations of all government authorities having jurisdiction, applicable State Code, and ACI 318.
- B. Testing and Inspecting: Engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and to prepare and submit reports.
- C. Inspections:
1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for

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- each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C 31/C 31M, and either ASTM C617 (Bonded Caps) or ASTM C1231 (Unbonded Caps).
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 - c. Cast and field cure additional sets of two standard cylinder specimens for construction sequencing purposes for each composite sample.
 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
 9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 24 hours of finishing.

SECTION 033000 – CAST-IN-PLACE CONCRETE

3.18 PROTECTION OF LIQUID FLOOR TREATMENTS

- A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION

SECTION 061000 – ROUGH CARPENTRY

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Rough framing. Refer to Schedule located at the end of this Section.
- B. Wood furring and grounds.
- C. Concealed wood blocking for support of miscellaneous items.
- D. Telephone and electrical panel backboards.
- E. Preservative treatment of wood.

1.2 RELATED WORK

- A. Section 092600 - Gypsum Board Systems: Installation of wood blocking for support of miscellaneous items.
- B. Divisions 22, 23, 26 – For support of Plumbing, HVAC, and Electrical work.

1.3 REFERENCES

- A. ALSC - American Lumber Standards Committee: Softwood Lumber Standards.
- B. APA: American Plywood Association.
- C. AWWA (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.

1.4 QUALITY ASSURANCE

- A. Rough Carpentry Lumber: Visible grade stamp, of agency certified by National Forest Products Association (NFPA).
- B. Perform work in accordance with the following agencies:
 - 1. Lumber Grading Agency: Certified by ALSC.
 - 2. Plywood Grading Agency: Certified by APA.

PART 2 PRODUCTS

2.1 ROUGH CARPENTRY MATERIALS

- A. Lumber: Comply with DOC 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.

SECTION 061000 – ROUGH CARPENTRY

- B. Interior Plywood Wall Sheathing: 3/4" APA Rated Sheathing, Span Rating 24-16; Exterior Exposure Durability – 1.

2.2 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Fasteners: Hot-dipped galvanized steel and stainless steel or better for high humidity and treated wood locations. The use of staples is not permitted.
 - 2. Anchors: Toggle bolt type for anchorage to hollow masonry and bolt or ballistic fastener for anchorages to steel.

PART 3 EXECUTION

3.1 FRAMING

- A. Set structural and non-structural members level and plumb, in correct position.

3.2 SCHEDULES

- A. Rough Carpentry:
 - 1. Non-Structural Framing as applicable.
 - 2. Furring for support of interior and exterior finish materials.
 - 3. Miscellaneous blocking for support of misc. items.
 - 4. Backboards for Electrical Panels and other equipment as 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. This Section includes the following:
 - 1. Plastic-laminate base and upper cabinets.
 - 2. Solid-surfacing-material countertops.
 - 3. Cabinet hardware
- B. Related Sections include the following:
 - 1. Division 06 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

1.3 REFERENCES

- A. AWI – Quality Standards
- B. FS MMM-A-130 – Adhesive, Contact.
- C. National Electric Manufacturer's Association (NEMA) LD3 – High Pressure Decorative Laminates.
- D. PS 1 – Construction and Industrial Plywood.
- E. PS 20 – American Softwood Lumber Standard.
- F. APA – American Plywood Association.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components. Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location, and schedule of finishes.
- C. Samples for Initial Selection:
 - 1. Solid-surfacing materials.
- D. Samples for Verification:
 - 1. Solid-surfacing materials, 6 inches square.
 - 2. Exposed cabinet hardware and accessories, one unit for each type.

SECTION 064100 - CUSTOM CASEWORK

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Certified participant in AWI's Quality Certification Program.
- C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products to site under provisions of Division 1 – General Requirements.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.
 - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

- A. Coordinate work under provisions of Division 1 – General Requirements.

PART 2 - PRODUCTS

2.1 CASEWORK MATERIALS AND MISCELLANEOUS ACCESSORIES

- A. Wood Particleboard: #45 per AWI standard, composed of wood chips, medium density, made with high waterproof resin binders of grade to suit application; sanded faces, located as follows:

<u>Item</u>	<u>Thickness</u>
Drawer and Door Faces	3/4"
Cabinet Sides and Supports	1/2"
Drawer Construction	1/2"

SECTION 064100 - CUSTOM CASEWORK

- B. Certified Wood: Interior architectural woodwork shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- C. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

2.2 MANUFACTURERS

- A. Plastic Laminate:
 - 1. Formica Corporation
 - 2. Wilsonart
 - 3. Substitutions: Under provisions of Division 1 – General Requirements.

2.3 PLASTIC LAMINATE MATERIALS

- A. Plastic Laminate: NEMA LD 3-1985, GP 50 Grade, .050 inch thick, General Purpose quality; All doors, drawers, etc. Color, pattern, and surface texture as selected by Architect. Assume 4 possible color selections.
- B. Plastic Laminate Backing Sheet: LD 3 BK-20; .020 inch thick Backing Sheet grade, smooth surface finish, undecorated plastic laminate (all concealed locations).
- C. Cabinet Liner: CL 20 grade, .020 inch thick, all interior casework surfaces.

2.4 ACCESSORIES

- A. Adhesive: FS MMM-A-130 contact adhesive, Type recommended by AWI and laminate manufacturer to suit application.
- B. Fasteners: Size and type to suit application.
- C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; finish in concealed locations and finish in exposed locations.
- D. Concealed Joint Fasteners: Threaded steel.

2.5 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.
- B. Drawer Slides: Blum BS426A (full extension), size as required.
- C. Pulls: Stanley 4484, US26D; 4" wire pull. Color to be selected by Architect.

2.6 SOLID POLYMER FABRICATIONS

- A. DuPont Corian Surfacing
 - 1. Finish countertop thickness, min: 1/2" solid surface over 3/4" plywood; see drawings.

SECTION 064100 - CUSTOM CASEWORK

- B. Or approved equal.
 - 1. Substitutes: Under provisions of Division 1 – General Requirements.
- C. Materials:
 - 1. 33% binding resins, 66% minerals; non-porous and stain resistant.
 - 2. 1/2" thick material.
 - 3. Color: To be selected from manufacturer's full color range.

2.7 COUNTER SUPPORT BRACKETS

- A. Heavy Duty Counter Support Brackets:
 - 1. Basis of Design: Heavy Duty Counter Support brackets: "Black" by CountertopBracket.com
 - 2. Color: Black.
 - 3. Spacing: 36" o.c. max – provide supplemental wood blocking to allow 36" on center spacings.

2.8 FABRICATION, GENERAL

- A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- B. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- C. Door and Drawer Fronts: 3/4 inch thick; overlay style.
- D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- E. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises.
- F. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
- G. Solid surface fabrications to be performed by a certified Corian fabricator/installer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing.

3.2 INSTALLATION

- A. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Maintain veneer sequence matching of cabinets with transparent finish.

- B. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 3. Calk space between countertop and wall with sealant specified in Division 07 Section "Joint Sealants."

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Adjust moving or operating parts to function smoothly and correctly.
- C. Clean work under provisions of Division 1 – General Requirements.
- D. Clean casework, counters, hardware, fittings, and fixtures.

END OF SECTION

SECTION 072100 – THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Batt insulation for sound attenuation.
- B. Related Sections:
 - 1. Section 092600 - Gypsum Board Systems.

1.3 REFERENCES

- A. American Society for Testing and Materials:
 - 1. ASTM C209 - Cellulosic Fiber Insulating Board, Water Absorption.
 - 2. ASTM C1289 - Type 1, Class 2: Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - 3. ASTM D1622 - Apparent Density of Rigid Cellular Plastics.
 - 4. ASTM E84 - Surface Burning Characteristics of Building Materials.
 - 5. ASTM E96 - Water Vapor Transmission of Materials.
 - 6. ASTM C665 - Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 7. National Fire Protection Association: NFPA 255 - Test of Surface Burning Characteristics of Building Materials.
 - 8. Underwriters Laboratories: UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.4 SYSTEM DESCRIPTION

- A. Provide continuity of thermal barrier at building enclosure elements.
- B. Provide acoustical attenuation of sound via sound batt insulation installed in gypsum wallboard partitions and assemblies.
- C. Provide batt insulation in acoustical gypsum wall board assemblies installed above and as an acoustical continuation of acoustically rated CMU partition walls where noted on Drawings.

1.5 SUBMITTALS

- A. Submit product data for specified items.
- B. Submit manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 ACOUSTICAL INSULATION MATERIALS

- A. Manufacturers:
 - 1. CertainTeed Corporation: Partition Batts.
 - 2. Guardian Fiberglass: Unfaced Building Insulation.
 - 3. Johns Manville: Unfaced Batts.
 - 4. Or approved Equal.
- B. Products:
 - 1. Insulation: preformed glass fiber batt roll type unfaced:

- a. ASTM Standard C 665: Type I.
- b. ASTM E84: flame spread 25 maximum; smoke developed 50 maximum.
- c. Thickness as indicated on Drawings and as required.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation boards are dry and ready to receive insulation and adhesive.
- B. Verify substrate surface is flat, free of honeycomb, fins, irregularities and materials or substances that may impede adhesive bond.
- C. Verify insulation boards are unbroken, free of damage.

3.2 INSTALLATION - ACOUSTICAL BATT INSULATION

- A. Install insulation in accordance with insulation manufacturer's instructions.
- B. Install continuous without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces.
- D. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.

3.3 PROTECTION OF FINISHED WORK

- A. Do not permit work to be damaged prior to covering insulation.
- B. Protect ventilated insulation work from exposure to moisture damage and deterioration, primarily by prompt installation of the roofing and waterproofing work.

END OF SECTION

PART GENERAL

1.1 SECTION INCLUDES

- A. Fireproof firestopping and firesafing materials and accessories.

1.2 RELATED SECTIONS

- A. Section 092600 - Gypsum Board Systems: Gypsum wallboard firesafing.
- B. Division 15 - Mechanical: Mechanical work requiring firesafing.
- C. Division 16 - 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

SECTION 072700 - FIRESTOPPING

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 concrete floor. 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 064100 - Custom Casework.
- C. Section 081100 - FRP Flush Doors.
- D. Section 081120 - Standard Steel Frames.
- E. Section 084100 - Aluminum Entrances and Storefronts.

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 C919 - Use of Sealants in Acoustical Applications.
- E. ASTM C920 - Elastomeric Joint Sealants.
- F. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
- G. ASTM D1565 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Open-Cell Foam).
- H. SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.

1.4 SUBMITTALS

- A. Submit under provisions of Division 1 - General Requirements.
- B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- C. Samples: Submit two samples, illustrating sealant colors for selection.
- D. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE

SECTION 079000 - JOINT SEALERS

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Maintain one copy of each document on site.

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 work under provisions of Division 1 - General Requirements.
- B. Coordinate the work with all sections referencing this section.

1.9 WARRANTY

- A. Provide five year warranty under provisions of Division 1 - General Requirements.
- B. Warranty: Include coverage for installed sealants and accessories which fail to achieve air tight seal, water tight seal, and exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.1 SEALANTS

	<u>Location</u>	<u>Type</u>	<u>Color</u>
A.	Laminate Counters	Silicone Single Component	Clear
B.	Door Frame/Walls	Acrylic, Latex	Paint to match
C.	Under Thresholds	Butyl Rubber	Black
D.	Doors & Windows to Metal Siding	Silicone Pecora 890 FTS	Selected by Architect
E.	Doors & Windows to Metal Trim	Silicone Pecora 890 FTS	Selected by Architect
F.	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.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave.

SECTION 079000 - JOINT SEALERS

3.4 CLEANING

- A. Clean work under provisions of Division 1 - General Requirements.
- B. Clean adjacent soiled surfaces.

3.5 PROTECTION OF FINISHED WORK

- A. Protect finished installation under provisions of Division 1 - General Requirements.
- B. Protect sealants until cured.

END OF SECTION

PART 1 GENERAL**1.1 RELATED SECTIONS**

- A. Section Includes:
 - 1. Exterior FRP flush doors with aluminum frames.

1.2 QUALITY ASSURANCE

- A. Standards: Comply with the requirements and recommendations in applicable specification and standards by AAMA, except to the extent more stringent requirements are indicated.
- B. Field Measurements: Field verify all information prior to fabrication and furnishing of materials. Furnish and install materials omitted due to lack of verification at no additional cost to Owner.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product data.
- B. Submit shop drawings for the installation of the doors, new frames, and associated components.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to job site in their original; unopened packages with labels intact. Inspect materials for damage and advise manufacturer immediately of any unsatisfactory materials.

PART 2 PRODUCTS**2.1 FIBERGLASS-REINFORCED POLYESTER (FRP) DOORS (EXTERIOR)**

- A. Manufacturers:
 - 1. Special-Lite, Inc.: SL-17 - 15 Colors (Basis of Design).
 - 2. Markar Architectural Products: Solution Door.
 - 3. Or approved equal:
- B. Products - FRP Door construction: Of type, size and design indicated:
 - 1. Minimum Thickness: 1.75 ", 5 ply composite laminate system.
 - 2. Face Panels: 0.125" composite exterior grade, exterior and interior FRO panels, polyester resin glass fiber reinforced panels, with UV inhibitors, random pebble texture, Class "A" rating for flame spread and smoke generation.
 - 3. FRP Color: Custom color to be selected by Architect. Skin color to be pigmented throughout FRP thickness, painted FRP surfaces will not be accepted.
 - 4. Core Liner: Foam core of door shall be completely covered on interior and exterior sides of core with contiguous sheets of 0.032" thick aluminum.
 - 5. Reinforcement: Internal tube shall reinforce the full internal door perimeter to allow for installation of all hardware.
 - 6. Core: Pre-stabilized, five pound minimum, EPS foam core, 100 percent bilateral lamination to facing substrate and to internal reinforcement system.
 - 7. Door Edge: Door perimeter shall be trimmed with a field replaceable 6063-T5 extruded aluminum alloy, with a beveled edge on the lock stile and a clip mortise squares edged on the hinge stile, to protect door edges.
 - 8. Weatherstripping: Lock stile of door shall have wool pile weatherstripping

SECTION 081100 - FRP FLUSH DOORS AND ALUMINUM FRAMING SYSTEMS

- applied.
- 9. Hardware: Factory installed.
- 10. Reglet: Integral.
- 11. Fasteners: Aluminum, non-magnetic stainless steel or other non-corrosive metal fasteners, compatible with frames and other items being fastened. For exposed fasteners (if any), provide phillips head screws with finish matching the item to be fastened.

2.2 ALUMINUM FRAMING SYSTEM

- A. Furnish frame components from the door manufacturer, as an integral system.
- B. Framing System:
 - 1. Frame members: Box type with four (4) enclosed sides. Open back framing will not be acceptable.
 - 2. Wall thickness: 0.125" minimum.
 - 2. Material: Alloy and temper as recommended by manufacturer for strength, corrosion resistance; ASTM B221 for extrusions, ASTM B209 for sheet/plate.
 - 3. Stops for side, transom and borrowed lites and panels:
 - a. Applied.
 - b. 0.625" high.
 - c. With fasteners exposed on interior or unsecured portion only.
 - d. With weatherstripping.
 - 4. Reinforcement Internal For hardware reinforcement.
 - 5. Hardware: Factory installed.
 - 6. Sidelites: Factory preassemble to the greatest extent possible, and mark frame assemblies according to location.
 - 7. Capping: 0.093" thick, with insert frame as shown. Finish to match framing.
 - 8. Finish: Anodized Surfaces: AAM12C22A31 clear 204-R1.
- C. Caulk joints before assembling frame members. Secure joints with fasteners and provide a hairline butt joint appearance. Prefit doors to frame assembly and factory prior to shipment. Field fabrication of framing using stick material is not acceptable.

2.4 FASTENERS

- A. All fasteners for all hardware shall be type 304 CRSS (18-8 Series corrosion resistant stainless steel) with no exception. No carbon steel or aluminum components shall be used.

2.5 HARDWARE

- A. Provide and install hardware as listed in other sections(s). If manufacturer's standard screws do not comply, supplier shall furnish suggested screw size and type in 301 CRSS (18-8 SS).
- B. Frames shall be factory machined and drilled for all hardware requiring mortises, with #12x1" long stainless steel screws pre-installed for hinge attachment.
- C. Hardware shall be furnished as listed in section 087100 or as so by designated in appropriate section and shall be coordinated by GC and installed by experienced mechanics.
- D. Supplier shall furnish manufacturer's standard templates, installation instructions, or full size approved door and frame preparation instructions as approved by the architect and as required by door and frame manufacturer prior to door and frame factory initiated

SECTION 081100 - FRP FLUSH DOORS AND ALUMINUM FRAMING SYSTEMS

manufacture. Standard factory lead-time for production of FRP doors and frames shall commence only and when all distributor required preparation information is received and acknowledged by the door and frame manufacturer.

2.7 FABRICATION

- A. Sizes and Profiles: The required sizes for frame units, and profile requirements are to accommodate existing doors.
- A. Coordination of Fabrication: Field measure before fabrication and show recorded measurements on final shop drawings.
- B. Complete the cutting, fitting, forming, drilling and grinding of all metal work prior to assembly. Remove burrs from cut edges and ease edges and corners to a radius of approximately 1/64".
- C. Maintain continuity of line and accurate relation of planes and angles. Secure attachments and support at mechanical joints, with hairline fit at contacting members.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's recommendations and specifications for the installation of the doors and frames.
- B. Set units plumb, level and true to line, without warp or rack of doors or frames. Anchor securely in place. Separate aluminum and other metal surfaces with bituminous coatings or other means as approved by Architect.
- C. Install with anchors appropriate for wall conditions to anchor framing to wall materials. A minimum of five anchors up to 7'-4" on jamb members, and one additional anchor for each foot over 7'-4". Secure head and sill members of transom, sidelites and similar conditions.
- D. Set thresholds in a bed of mastic and backseal.
- E. Clean surfaces promptly after installation of doors and frames, exercising care to avoid damage to the protective coatings.
- F. Ensure that the doors and frames will be without damage or deterioration (other than normal weathering) at the time of acceptance.
- G. Provide Owner with all adjustment tools and instruction sheets. Arrange an in-service session to Owner at Owner's convenience. Provide a minimum one-year written warranty on all labor related to this section. All workmanship which is defective or deficient shall be corrected to the Owner's satisfaction and at no additional cost to the Owner.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Non-rated steel doors.

1.2 RELATED SECTIONS

- A. Section 081120 - Standard Steel Frames.
- B. Section 087100 - Door Hardware.
- C. Section 088000 - Glazing.
- 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.

SECTION 081110 - STANDARD STEEL DOORS

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. Interior Doors: SDI-100, 18 gage, Grade II, flush door style M; half lite door style HL 18 x 32 and vision panel door style VPP 10 x 10.

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.

SECTION 081110 - STANDARD STEEL DOORS

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.
- D. Attach fire rating label to each door unit.

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

SECTION 081120 - STANDARD STEEL FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Non-rated steel door frames.

1.2 RELATED SECTIONS

- A. Section 081110 - Standard Steel Doors
- B. Section 087100 - Door Hardware.
- C. Section 092600 – Gypsum Board Systems.
- D. Section 099000 – Paints and Coatings: 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. 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. Submit under provisions of Division 1 - General Requirements.
- B. Shop Drawings: Indicate frame elevations, reinforcement, and finish.
- C. Product Data: Indicate frame configuration, anchor types and spacings, 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 Conditions.
- B. Accept frames on site in manufacturer's packaging. Inspect for damage.

1.8 FIELD MEASUREMENTS

SECTION 081120 - STANDARD STEEL FRAMES

- 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 frame opening construction, door, and hardware installation.

PART 2 PRODUCTS

2.1 FRAME MANUFACTURERS

- A. Republic Builders Products Corp.
- B. Steelcraft.
- C. Or approved equal.

2.2 FRAMES

- A. Interior Frames: 16 gage thick material, base metal thickness.

2.3 ACCESSORIES

- A. Silencers: Resilient rubber, fitted into drilled hole.

2.4 FABRICATION

- A. Fabricate frames as knock down unit
- B. Fabricate frames with hardware reinforcement plates welded in place.
- C. Prepare frame for silencers. Provide three single silencers for single doors on strike side.
- D. Fabricate frames to suit gypsum wall board with 2-inch head member or as indicated on drawings.
- E. Jamb depth as indicated on drawings and to suit application.

2.5 FINISH

- A. Steel Sheet: Galvanized to ASTM A525 A60.
- B. Primer: Air dried.

SECTION 081120 - STANDARD STEEL FRAMES

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 frames in accordance with ANSI/SDI-100 and DHI.
- B. Coordinate with wallboard wall construction for anchor placement.
- C. Coordinate installation of frames with installation of hardware specified in Section 087100 and doors in Section 082110.

3.3 ERECTION TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Exterior aluminum storefront entrance frames.
- B. Fixed aluminum and glass window units.
- C. Perimeter sealant.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Section 087100 - Door Hardware: Hardware items for FRP doors.

1.3 RELATED SECTIONS

- A. Section 079000 - Sealants: System perimeter sealant and back-up materials.
- B. Section 081100 – FRP Flush Doors and Aluminum Framing Systems.

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. YKK YES 45 TU Storefront Framing System; Center Set – Exterior aluminum storefront entrance frames and fixed aluminum exterior windows.
- 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 (STOREFRONT/WINDOW UNITS) – YKK YES 45 TU

- A. Frame: 2" x 4½" 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. Base: sidelight base; non-thermally broken, 4½" x 4½" nominal.
- E. Flashings: .040 inch minimum, aluminum, finish to match mullion sections where exposed.
- F. Heavy Wall Mullion: 2" x 4½" nominal; thermally broken; locations as required by system manufacturer.
- G. Thermal Flat Filler: Compatible with system; continuous filler strips.
- H. Strap Anchor: Compatible with system.
- I. Shims: Plastic horseshoe type.

2.4 GLASS AND GLAZING MATERIALS

- A. Glass and Glazing Materials: As specified in Section 088000 or as described above.

2.5 SEALANT MATERIALS

- A. Sealant and Backing Materials: As specified in Section 079000.

2.6 HARDWARE

- A. See Hardware Schedule - Section 087100 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.

SECTION 084100 - ALUMINUM ENTRANCES AND STOREFRONTS

2.8 FINISHES – YKK STOREFRONT/ WINDOW UNITS

- A. Medium Bronze (YB11N) Anodized Finish: Prepare aluminum surfaces for specified finish; apply shop finish in accordance with the following:
 - 1. Anodic Coating: Electrolytic color coating followed by an organic seal applied in accordance with the requirements of AAMA 612-02. Aluminum extrusions shall be produced from quality controlled billets meeting AA-6063-T5.
 - a. Exposed Surfaces shall be free of scratches and other serious blemishes.
 - b. Extrusions shall be given a caustic etch followed by an anodic oxide treatment and then sealed with an organic coating applied with an electrodeposition process.
 - c. The anodized coating shall comply with all of the requirements of AAMA 612-02: Voluntary Specifications, Performance Requirements and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum. Testing shall demonstrate the ability of the finish to resist damage from mortar, salt spray, and chemicals commonly found on construction sites, and to resist the loss of color and gloss.
 - d. Overall coating thickness for finishes shall be a minimum of 0.7 mils.

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.

SECTION 084100 - ALUMINUM ENTRANCES AND STOREFRONTS

- H. Install hardware using templates provided. Refer to Section 08712 for installation requirements.
- I. Install glass in accordance with Section 088000, 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

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding doors.
 - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames".
 - 2. Division 08 Section "Flush Wood Doors".
 - 3. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series.
 - 2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
 - 3. ANSI/UL 294 - Access Control System Units.
 - 4. UL 305 - Panic Hardware.
 - 5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
 - 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
 - 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
 - 1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.
- B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

- F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 - 3. Review sequence of operation narratives for each unique access controlled opening.
 - 4. Review and finalize construction schedule and verify availability of materials.
 - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check

Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 BUTT HINGES

- A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 - 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 - 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

- a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
5. Manufacturers:
 - a. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.2 CONTINUOUS HINGES

- A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
 1. Where specified, provide modular continuous geared hinges that ship in two or three pieces and form a single continuous hinge upon installation.
 2. Manufacturers:
 - a. Pemko (PE).

2.3 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.
 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 2. Furnish dust proof strikes for bottom bolts.
 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
 5. Manufacturers:
 - a. Rockwood (RO).
- B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
 1. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.

2. Pulls, where applicable, shall be provided with a 10" clearance from the finished floor on the push side to accommodate wheelchair accessibility.
3. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
4. Manufacturers:
 - a. Rockwood (RO).

2.4 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
 1. Threaded mortise cylinders with rings and cams to suit hardware application.
 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
 4. Tubular deadlocks and other auxiliary locks.
 5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 6. Keyway: Manufacturer's Standard.
- C. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- D. Keying System: Each type of lock and cylinders to be factory keyed.
 1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. Existing System: Field verify and key cylinders to match Owner's existing system.
- E. Key Quantity: Provide the following minimum number of keys:
 1. Change Keys per Cylinder: Two (2)
 2. Master Keys (per Master Key Level/Group): Five (5).
 3. Construction Control Keys (where required): Two (2).
 4. Permanent Control Keys (where required): Two (2).
- F. Construction Keying: Provide temporary keyed construction cores.
- G. Key Registration List (Bitting List):
 1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
 2. Provide transcript list in writing or electronic file as directed by the Owner.

2.5 KEY CONTROL

- A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
1. Manufacturers:
 - a. Lund Equipment (LU).
 - b. MMF Industries (MM).
 - c. Telkee (TK).

2.6 MORTISE LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.
1. Manufacturers:
 - a. ASSA ABLOY ACCENTRA, formerly known as Yale (YA) - 8800FL Series.

2.7 CYLINDRICAL LOCKS AND LATCHING DEVICES

- A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.
1. Manufacturers:
 - a. ASSA ABLOY ACCENTRA, formerly known as Yale (YA) - 5400LN Series.

2.8 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 2. Strikes for Bored Locks and Latches: BHMA A156.2.

3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.9 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Electromechanical exit devices shall have the following functions and features:
 - a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
 - b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
 - c. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.

- d. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.
 - e. Five-year limited warranty for electromechanical features.
2. Manufacturers:
- a. ASSA ABLOY ACCENTRA, formerly known as Yale (YA) - 7000 Series.

2.10 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
- 1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
 - 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 - 3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
 - 4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 - 5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 - 6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
- 1. Heavy duty surface mounted door closers shall have a 30-year warranty.
 - 2. Manufacturers:
 - a. ASSA ABLOY ACCENTRA, formerly known as Yale (YA) - 4400 Series.
- C. Door Closers, Surface Mounted (Unitrol): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted closers with door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.
- 1. Manufacturers:
 - a. ASSA ABLOY ACCENTRA, formerly known as Yale (YA) - Unitrol Series.

2.11 ARCHITECTURAL TRIM**A. Door Protective Trim**

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, .050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
 - a. Rockwood (RO).

2.12 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 1. Manufacturers:
 - a. Rockwood (RO).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
 1. Manufacturers:
 - a. Norton Rixson (RF).

2.13 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 - 1. Pemko (PE).

2.14 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.15 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

- F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
 - 1. Quantities listed are for each pair of doors, or for each single door.

SECTION 087100 – DOOR HARDWARE

2. The supplier is responsible for handing and sizing all products.
 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.
1. Section 08 71 00 – Door Hardware.
- C. Manufacturer's Abbreviations:
1. GS - ASSA ABLOY Glass Solutions
 2. MK - McKinney
 3. MR - Markar
 4. PE - Pemko
 5. RF - Rixson
 6. SU - Securitron
 7. RO - Rockwood
 8. YA - ASSA ABLOY ACCENTRA
 9. SA - SARGENT
 10. OT - Other
 11. HS - HES
 12. NO - Norton

Hardware Sets

Set: 1.0

Doors: 1, 25, 26, 27, 28, 29, 29A, 30, 30A, 31, 37, 37A, 7

1 Continuous Hinge	CFM__SLF-HD1 PT		PE	087100
1 Electric Power Transfer	EL-CEPT	630	SU	087100
1 Rim Exit Device, Nightlatch	7100 MELR 121NL K845xCT6LL ECK1	630	YA	087100
1 Permanent Core	1210 GB	626	YA	087100
1 Door Pull	BF157	US32D	RO	087100
1 Surface Closer	UNI4400	689	YA	087100
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1 Gasketing	By Alum Storefront Mfr		OT	
1 Rain Guard	346C		PE	087100
1 Sweep	18061CNB		PE	087100
1 Threshold	273x224AFGT		PE	087100

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1 Harness, Frame	QC-C1500P	MK	087100
1 Harness, Exits	QC-C__P	MK	087100
1 Card Reader	By Security System Supplier	OT	
1 Power Supply	AQD/AQL Series	SU	087100
1 Wiring Diagram	Elevation and Point to Point as Specified	OT	

Notes: Theory of operation:

- Door normally closed and secure.
- Presenting valid credential at card reader retracts latch in exit device, allowing ingress.
- In the event of power failure, door remains closed and secure.
- Manual key override provided.
- Free egress allowed at all times.

Set: 2.0

Doors: 5

3 Hinge, Full Mortise, Int	TA2714 [NRP]	US26D	MK	087100
1 Storeroom Lock	AU 5405LN Temp Core-LFIC	626	YA	087100
1 Permanent Core	1210 GB	626	YA	087100
1 Conc Overhead Stop	5-_36	652	RF	087100

Set: 4.0

Doors: 4

3 Hinge, Full Mortise, Int	TA2714 [NRP]	US26D	MK	087100
1 Office Lock	AU 5404LN Temp Core-LFIC	626	YA	087100
1 Permanent Core	1210 GB	626	YA	087100
1 Wall/Floor Stop	409 [OR] 441	US26D	RO	087100

Set: 5.0

Doors: 6

6 Hinge, Full Mortise, Int	TA2714 [NRP]	US26D	MK	087100
2 Flush Bolt	555 (12", 72" A.F.F.)	US26D	RO	087100
1 Dust Proof Strike	570	US26D	RO	087100
1 Institutional Lock	AU 5430LN	626	YA	087100
2 Conc Overhead Stop	5-_36	652	RF	087100
1 Surface Closer	4400	689	YA	087100
2 Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100

SECTION 087100 – DOOR HARDWARE

Notes: ***Verify with AHJ that the above specified hardware items do not conflict with life safety.***

Set: 6.0

Doors: 2

3 Hinge, Full Mortise, Int	TA2714 [NRP]	US26D	MK	087100
1 Privacy Lock	AUR 8802FL V21	626	YA	087100
1 Surface Closer	4400	689	YA	087100
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1 Wall/Floor Stop	409 [OR] 441	US26D	RO	087100
1 Gasketing	S88BL		PE	087100

Set: 7.0

Doors: 3, 4A

3 Hinge, Full Mortise, Int	TA2714 [NRP]	US26D	MK	087100
1 Electric Power Transfer	EL-CEPT	630	SU	087100
1 Fail Secure Lock	AU 5491LN Temp Core-LFIC	626	YA	087100
1 Permanent Core	1210 GB	626	YA	087100
1 Surface Closer	4400	689	YA	087100
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1 Wall/Floor Stop	409 [OR] 441	US26D	RO	087100
1 Harness, Frame	QC-C1500P		MK	087100
1 Harness, Locks	QC-C__P		MK	087100
1 Card Reader	By Security System Supplier		OT	
1 Power Supply	AQD/AQL Series		SU	087100
1 Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes: Theory of Operation:

- Door normally closed and secure.
- Presenting valid credential at card reader energizes lock, allowing ingress.
- In the event of power failure, door remains closed and secure.
- Manual key override provided.
- Free egress allowed at all times.

Set: 8.0

Doors: 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 32, 33, 34, 35, 36, 8, 9

1 All Hardware	By Overhead Door Manufacturer	OT
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END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Glass and glazing for doors, windows and storefronts.

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 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.

SECTION 088000 - GLAZING

- 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. 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 1/4" clear annealed glass and interior pane of 1/4" clear annealed Solarban 60 Low-E #3 surface 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 1/4" tempered clear glass and interior pane of 1/4" tempered clear Solarban 60 Low-E #3 surface glass; purge interpane 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. See Architectural Drawings for additional glazing types/requirements.

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.

SECTION 088000 - GLAZING

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 sealant 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 frame 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

SECTION 092600 - GYPSUM BOARD SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Gypsum Sheathing board.
 - 2. Accessories.
- B. Related Sections:
 - 1. Section 061000 - Rough Carpentry: Wood blocking.
 - 2. Section 099100 – Paints and Coatings: Surface finish.

1.2 REFERENCES

- A. American Society for Testing and Materials:
 - 1. ASTM C36 - Gypsum Wallboard.
 - 2. ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.
 - 3. ASTM C754 - Installation of Framing Members to Receive Screw Attached Gypsum Wallboard, Backing Board, or Water-Resistant Backing Board.
 - 4. ASTM C840 - Application and Finishing of Gypsum Board.
 - 5. ASTM C1002 - Steel Drill Screws for the Application of Gypsum Board.
- B. Gypsum Association:
 - 1. GA-201 - Gypsum Board for Walls and Ceilings.
 - 2. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.
 - 3. GA-600 - Fire Resistance Design Manual

1.4 SUBMITTALS

- A. Submit under provisions of Division 1 - General Requirements.
- B. Product Data: Provide data on metal framing, gypsum board, joint and tape.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM C840 and GA-600.

1.6 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section with minimum 3 years' documented experience.

1.7 REGULATORY REQUIREMENTS

- A. Conform to applicable code for fire-rated assemblies and as referenced on drawing details.

PART 2 PRODUCTS

2.1 GYPSUM BOARD SYSTEM

- B. Manufacturers:
 - 1. Georgia Pacific - Basis of Design.
 - 2. National Gypsum.
 - 3. USG Corp

SECTION 092600 - GYPSUM BOARD SYSTEMS

- 4. Or approved equal.
- 5. Substitutions: Under provisions of Division 1 - General Requirements.

2.2 MATERIALS

- A. Abuse Resistant Gypsum Board: Hi-Abuse Brand Wallboard, fire resistant gypsum core encased in a heavy, smooth, white abrasion resistant paper on the face side and heavy liner paper on the back side, 5/8" thick. Conforming to the physical properties of ASTM C36 and ASTM C1177 on Glass mat back. Rating of 10 "No Mold Growth" as tested for 4 weeks according to ASTM D3273 'Armor Plus' manufactured by Georgia-Pacific Corporation or approved equal.

2.3 ACCESSORIES

- A. Acoustic Insulation: As specified in Section 072130 - Batt Insulation.
- B. Acoustical Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board; recommended by manufacturer.
- C. Corner Beads: Metal.
- D. Edge Trim: Metal.
- E. Joint Materials: ASTM C475; reinforcing tape, joint compound, adhesive, and water.
- F. Joint Tape (Abuse Resistant Gypsum Board): 2" wide, 10x10 glass mesh tape.
- G. Fasteners: ASTM C1002, Type S12; size and finish as recommended by manufacturer.
- H. Adhesive: General purpose; as recommended by panel manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify site conditions under provisions of Division 1 - General Requirements.
- 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.
- C. Use screws when fastening gypsum board to metal furring or framing.
- D. Place control joints consistent with lines of building spaces.
- E. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.

SECTION 092600 - GYPSUM BOARD SYSTEMS

3.3 JOINT TREATMENT

- A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
- A. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.
- B. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile.

3.4 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.5 FINISH (INTERIOR GWB)

- A. Level 1: Areas above finished ceilings, concealed from view.
 - 1. All joints and interior angles to have tape set in joint compound.
 - 2. Surface free of excess joint compound.
 - 3. Tool marks and ridges are acceptable.
- B. Level 5: All walls, ceilings, and soffits exposed to view.
 - 1. All joints and interior angles to have tape set in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles.
 - 2. Fastener heads and accessories covered with three separate coats of joint compound.
 - 3. All joint compound to be smooth and free of tool marks and ridges.
 - 4. A skim coat of joint compound, or material manufactured especially for this purpose, is applied to the entire surface.

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.

SECTION 095110 - SUSPENDED ACOUSTICAL CEILINGS

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: ASTM C635, intermediate duty; exposed T; components die cut and interlocking; hot dipped galvanized. Product: Prelude 15/16" T-bar grid suspension system.
- B. Grid: Prelude 15/16" Grid – White.
- C. Accessories: Stabilizer bars, hold-down clips, splices, edge and moldings required for suspended grid system.
- D. 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. Acoustical Tile - Armstrong Angled Tegular Dune No. 1776; conforming to the following:
 - 1. Size: 24 x 48 inches.
 - 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.
9. Color: White.
10. Factory applied vinyl latex paint.
11. Humidity Resistance: Humiguard Plus.

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 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.

SECTION 095110 - SUSPENDED ACOUSTICAL CEILINGS

- 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 acoustical 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

SECTION 096500 - RESILIENT FLOORING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient vinyl tile flooring (VCT).
 - 2. Resilient wall base.
- B. Related Sections:
 - 1. Section 033000 – Cast-In-Place Concrete.
 - 2. Section 061000 – Rough Carpentry.
 - 3. Section 092600 – Gypsum Board Systems.

1.2 REFERENCES

- A. American Society for Testing and Materials:
 - 1. ASTM E648/NFPA 253 - Critical Radiant Flux - Class 1.
 - 2. ASTM E 662/NFPA 258 - Smoke - 450 or less.
 - 3. ASTM E84/NFPA 255 - Steiner Tunnel Test - Class C.
 - 4. ASTM F1066 - Vinyl Composition Floor Tile.
 - 5. ASTM F1861 Type TP, Group 1 (Solid) Standard Spec. for Resilient Wall Base.
 - 6. ATM D2240; Vinyl - 90, Shore A.
- 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.

SECTION 096500 - RESILIENT FLOORING

- 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. Vinyl Composition Tile:
 - 1. Armstrong (Standard Excelon)
 - 2. Or Approved Equal
- B. Vinyl Wall Base:
 - 1. Johnsonite / Tarkett
 - 2. Or Approved equal.

2.2 MATERIALS - VINYL TILE FLOORING (VCT)

- A. Vinyl Composition Tile: ASTM F1066:
 - 1. Size: 12 x 12 inch
 - 2. Thickness: 1/8 inch
 - 3. Design: non-directional
 - 4. Color: To Be Selected (Assume 2 Colors)
 - 5. Pattern: Random pattern. Two tile mix. Mix to be 80% / 20%.

2.3 MATERIALS - VINYL BASE

- A. Base: Homogenous polyvinyl chloride (PVC) wall base, coved; pre-molded external corners:
 - 1. Height: 4-inch.
 - 2. Thickness: 1/8 inch thick.
 - 3. Length: Roll (100 feet minimum).
 - 4. Color: 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. Transition Strips: Thickness change or change in material from VCT to any other material. Provide vinyl tile adapter. Colors as selected by Architect.
- D. Sealer and Wax: Types recommended by flooring manufacturer.

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. Conduct calcium chloride tests or perform relative humidity test.
- F. Conduct bond tests for compatibility with substrate.
- G. Test concrete floors for alkalinity. Floor to be in the range of 5 - 9 on the pH scale.

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.
- E. 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 pre-molded units.
- C. Install base on solid backing. Bond tight to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.
- E. Maintain 65 degrees for a minimum of 24 hours in all areas scheduled to receive base before, during and after installation.
- F. Uncoil base for a minimum of 24 hours prior to installation.

SECTION 096500 - RESILIENT FLOORING

3.5 CLEANING

- A. Clean work under provisions of Division 1 - General Requirements: Final Cleaning.
- B. Remove excess adhesive from floor, base, and wall surfaces without damage.
- C. Clean, seal, and wax floor and base surfaces in accordance with manufacturer's instructions.

3.6 PROTECTION OF FINISHED WORK

- A. Prohibit traffic on floor finish for 48 hours after installation.

3.7 SCHEDULE

- A. See Architectural Drawings, Finish Schedule for Materials and Locations.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Walk off carpet tile placed with glue-down method.
- B. Accessories.

1.2 RELATED SECTIONS

- A. Section 033000 - Cast-in-Place Concrete.
- B. Section 096500 - Resilient Flooring: resilient tile flooring; base and accessories.

1.3 REFERENCES

- A. ASTM D2859 - Test Method for Flammability of Finished Textile Floor Covering Materials.
- B. ASTM E84 - Surface Burning Characteristics of Building Materials.
- C. ASTM E648 - Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
- D. NFPA 253 - Test for Critical Radiant Flux of Floor Covering Systems.

1.4 SUBMITTALS

- A. Submit under provisions of Division 1 - General Requirements
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Samples: Submit two samples 6 x 6 inch in size illustrating color and pattern for each carpet material specified.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing specified carpet with minimum three years documented experience.
- B. Installer: Company specializing in installing carpet with minimum three years documented experience and approved by manufacturer.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for flame/smoke rating requirements in accordance with ASTM E84.
- B. Conform to ASTM D2859 for surface flammability ignition test.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Store materials for 3 days prior to installation in area of installation to achieve temperature stability.
- B. Maintain minimum 70 degrees F ambient temperature 3 days prior to, during and 24 hours after installation.

1.8 MAINTENANCE DATA

- A. Submit under provisions of Division 1 - General Requirements.
- B. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.9 EXTRA MATERIAL

- A. Furnish under provisions of Division 1 - General Requirements.
- B. Provide a total of 90 sq ft of carpeting of main type, color, and pattern specified.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - CARPETING / WALK-OFF CARPET

- A. Mannington Commercial - Walk-Off Carpet Tile.
- B. Substitutions: Under Provisions of Division 1 - General Requirements.

2.2 MATERIALS - WALK-OFF CARPET TILE

- A. Mannington – Ruffian II; 24" x 24" modular carpet tile, Infinity modular backing; 38 oz. face weight; post production type 6, 6 solution dyed nylon plus scraper fiber; color as selected by Architect. (Assume 1 color).
- B. Installation Method: Monolithic.

2.3 ACCESSORIES

- A. Sub-Floor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Adhesive: Recommended by entrance mat manufacturer.
- C. Transition Strips: As required to accommodate changes in flooring materials color as selected by Architect.

PART 3 EXECUTION

3.1 EXAMINATION

SECTION 096880 - CARPET

- A. Verify that surfaces are smooth and flat with maximum variation of 1/4 inch in 10 ft, and are ready to receive work.

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.
- B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- C. Vacuum clean substrate.

3.3 INSTALLATION

- A. Install carpet tile and adhesive in accordance with manufacturers' instructions.
- B. Verify carpet tile match before cutting to ensure minimal variation between dye lots.
- C. Double cut carpet tile, to allow intended seam and pattern match. Make cuts straight, true, and unfrayed. Edge seam carpet at public areas.
- D. Lay carpet tile tight and flat on subfloor, well fastened at edges, with a uniform appearance. Provide monolithic color, pattern, and texture match within any one area.
- E. Do not change run of pile in any room where carpet tile is continuous through a wall opening into another room. Locate change of color or pattern between rooms under door centerline.
- F. Cut and fit carpet tile around interruptions.
- G. Fit carpet tile tight to intersection with vertical surfaces without gaps.
- H. Install carpet tile in patterns specified/indicated.
- I. Provide walk-off tile in areas indicated on Finish Schedule.

3.4 CLEANING

- A. Clean work under provisions of Division 1 - General Requirements.
- B. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- C. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 099000 - PAINTS AND COATINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Surface preparation and field application of paints and coatings
- B. Related Sections:
 - 1. Division 05 - Metals: Shop primed items.
 - 2. Division 08 - Doors and Frames: Shop primed items.
 - 3. Section 092600 - Gypsum Board Systems.

1.2 REFERENCES

- A. American Society for Testing and Materials: ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.

1.3 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this Section.

1.4 SUBMITTALS

- A. Submit under provisions of Division 1 - General Requirements: Submittals.
- B. Product Data: Provide data on all finishing products and high-performance coatings.
- C. Samples: Submit samples illustrating range of colors and textures available for each surface finishing product scheduled.
- D. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.
- E. Manufacturer's Safety Data Sheet (MSDS) for each product used.

1.5 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 3-years documented experience and where applicable, approved by manufacturer.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable codes, standards and specifications referenced in this section.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 1 - General Requirements: Storage and Protection.
- 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.
- E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.8 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.

1.9 EXTRA MATERIALS

- A. Furnish under provisions of Division 1 – General Requirements.
- B. Provide 1 unopened gallon of each color, type, and surface texture to Owner.
- C. Label each container with color, type, texture, and room locations, in addition to the manufacturer's label.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- 1. Paints and Coatings:
 - 1. MAB /Sherwin Williams.
 - 2. Pittsburgh Paint.
 - 3. Minwax.
 - 4. Petri Paint Co.
 - 5. Or approved equal.

2.2 MATERIALS

A. Surface Cleaners:

1. Galvanized finish cleaner: Specifically for use on galvanized ferrous metals to:
 - a. Remove oils, "white rust," and other surface contaminants that impede adhesion of coatings;
 - b. Etch galvanized finish to provide "tooth" for coatings adhesion.

B. Coatings:

1. All coatings must be VOC compliant for use in New Jersey.
2. 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.

C. Products - Paints and Coatings:

1. Primers:
 - a. Alkyd primer: Exterior grade rust-inhibiting primer specifically intended for use on unprimed ferrous metal, compatible with intermediate/finish coat.
 - b. Acrylic latex primer: Exterior grade primer specifically intended for use on galvanized ferrous metal, compatible with intermediate/finish coat.
 - c. Latex primer sealer: Undercoater specifically intended for use on new (cured) drywall and plaster, compatible with intermediate / finish coat.
 - d. Primer/void-filler: Alkali resistant, water reducible, vinyl acetate/acrylic latex void filler specifically intended for use on (cured - 28 day minimum) concrete masonry substrates, compatible with intermediate/finish coat. for masonry substrates.
 - e. Epoxy Primer: Epoxy primer specifically intended for use on interior unfinished concrete.
2. Intermediate/finish coats:
 - a. Alkyd enamel: Exterior Grade, Premium grade, low odor latex enamel specifically intended for use on metal substrates.
 - b. Latex enamel: Interior grade, washable, non-yellowing latex enamel.
 - c. Acrylic epoxy finish: Interior grade, high performance, non-yellowing, water reducible low odor, two-part self-priming acrylic epoxy finish specifically intended for use on, abrasion-resistant semi-gloss finish.
 - d. High Build epoxy Coating: High build polyimide epoxy coating specifically intended for use on concrete floors subject to abrasion/constant cleaning.

2.3 FINISHES

- A. Refer to schedule at end of section for surface finish schedule.

PART 3 EXECUTION**3.1 EXAMINATION**

- A. Verify that surfaces and substrate conditions are ready to receive work as instructed by the product manufacturer.

SECTION 099000 - PAINTS AND COATINGS

- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop applied primer for compatibility with subsequent cover materials.
- D. 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. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
 - 3. 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 acrylic primer.
- G. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- H. 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.
- I. 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 with a long oil, rust inhibitive primer.

3.3 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.

SECTION 099000 - PAINTS AND COATINGS

- 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.

3.4 CLEANING

- A. Clean work under provisions of Division 1 - General Requirements: Final Cleaning.
- B. Collect waste material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 SCHEDULE - INTERIOR SURFACES

- A. Steel - Unprimed:
 - 1. One coat of primer: MAB Rust-O-Lastic Anti-Corrosive Primer.
 - 2. Two coats semi-gloss finish: MAB Rich Lux latex semi-gloss (023 Line) 150g/l.
- B. Steel - Primed:
 - 1. Touch-up with primer: MAB Rust-O-Lastic Anti-Corrosive Primer.
 - 2. Two coats semi-gloss finish: MAB Rich Lux latex semi-gloss (023 Line) 150g/l.
- C. Gypsum Board (allow for 2 colors):
 - 1. One coat of primer sealer: MAB Rich Lux Sealer Undercoater.
 - 2. Two coats of eggshell finish: MAB Rich Lux Latex eggshell enamel.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fire extinguishers.
- B. Cabinets.

1.2 RELATED SECTIONS

- A. Section 061000 - Rough Carpentry: 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.

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 061000 – Rough Carpentry.
- B. Section 092600 – Gypsum Board Systems.

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. Submit under provisions of Division 1 - General Requirements.
- B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
- C. 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 work under provisions of Division 1 - General Requirements.
- B. Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Bobrick – Accessories.
- 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 under provisions of Division 1 - General Requirements.
- 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.

3.4 SCHEDULE

- A. See Drawings for Accessory Schedule.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Engineered wood-framed structures consisting of the following components:
 - a. Factory-engineered wall columns.
 - b. Factory-engineered roof truss.
 - c. Factory-engineered metal roof and wall panels.
 - d. Factory-engineered building system accessories.
 - e. Prefinished metal trim items.
 - f. Prefinished ridge vents and soffits.

1.2 REFERENCES

- A. Reference Standards:
1. Preservative Treated Lumber:
 - a. American Wood Preservers Association (AWPA).
 2. Lumber grading rules and wood species:
 - a. National Design Specifications for Wood Construction, current edition.
 - b. Northeastern Lumber Manufacturer's Association, Inc. (NELMA).
 - c. Southern Pine Inspection Bureau (SPIB): Southern Pine.
 - d. West Coast Lumber Inspection Bureau (WCLIB): Douglas Fir.
 - e. Western Wood Products Association (WWPA): Douglas Fir and Ponderosa Pine.
 3. MSR Lumber Producers Council (MSR) for machine stress rated lumber.
 4. National Design Specifications for Wood Construction.
 5. National Design Standard for Metal Plate Connected Wood Truss Construction (TPI).
 6. AAMA 1402-86 – Aluminum Siding, Soffit, and Fascia.
 7. ASTM B 209 – Aluminum and Aluminum-Alloy Sheet and Plate.
 8. ASTM D 226 – Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
 9. ASTM E 84 – Surface Burning Characteristics of Building Materials.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-engineered product. Indicate component materials, dimensions, profiles, and construction and installation details.
1. Include information for specialty accessory products specified for this Project.
 2. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 3. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to truss fabricator.
 4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. Sizes, stress grades, and species of lumber.
 2. Anchor-bolt layout.
 3. Structural Framing Drawings: Show complete fabrication of primary and secondary framing. Include provisions for openings and the following information:
 - a. Slope or depth, span, and spacing of truss.
 - b. Heel bearing height.
 - c. Design loading to include:
 - 1) Top chord live load.

- 2) Top chord dead load.
 - 3) Bottom chord dead load.
 - 4) Concentrated loads and their points.
 - d. Adjustments to lumber and plate design values for conditions of use.
 - e. Plate type, thickness of gauge, and size.
 - f. Lumber size, species, and grade for each member.
 - 4. Metal Roof and Wall Panel Layout Drawings: Show layouts of metal panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and special details. Indicate the following components:
 - a. Roof mounted items.
 - b. Wall mounted items.
 - 5. Submit Shop Drawings that have been engineered and certified by professional engineer licensed in the State in which Project is located. Include seal and signature of professional engineer on Shop Drawings.
- C. Design Data: Truss engineering calculations for loading and stresses, bearing seal and signature of professional engineer licensed in the State in which Project is located. Include the following calculations:
- 1. Minimum design shall meet design standards of latest edition of International Building Code unless other, more stringent requirements are in force in Project location.
 - 2. Bending moments and axial forces for each member.
 - 3. Basic plate design values.
 - 4. Design analysis for each joint indicating that proper plates have been used.
 - 5. Provide design calculations for exterior walls, canopies, soffit systems, and lateral bracing walls. Design wind loads and lateral bracing loads are indicated on structural Drawings.
 - 6. Submit design calculations that have been engineered and certified by professional engineer licensed in the State in which Project is located. Include seal and signature of professional engineer on calculations
- D. Samples for Initial Selection: For units with factory-applied color finish, color chart of manufacturer's standard colors.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preservative-treated wood.
 - 2. Engineered wood products.
- B. Quality Control Submittals:
 - 1. Test Reports: Certified test reports showing compliance with specified performance characteristics.
 - 2. Certification: Manufacturer's certification that Products furnished meet specified design and performance criteria.
- C. Submit written proof of third-party inspection program in force for truss manufacturer used on Project.
- D. Certifications: Certify that specified roof and wind load requirements are met.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing and supplying Post Frame Buildings specified in this section with three years documented experience.

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- B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
- C. Source Limitations: Obtain engineered post frame building components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.
 - 1. Aluminum soffit system shall be fabricated and installed to comply with:
 - a. AAMA 1402-86.
 - b. International Code Council-ES Legacy – Report No. 97-64.
 - c. International Conference of Building Officials (ICBO): Report No. 2027.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store materials per manufacturer's requirements.
- B. Handle and store trusses to comply with recommendations in TPI BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."
 - 1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
 - 2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
 - 3. Provide for air circulation around stacks and under coverings.
 - 4. Store trusses to avoid contact with other materials that could create staining or discoloration.
- C. Inspect trusses upon deliver to Project site and notify manufacturer immediately if members have damage from handling or show discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

1.7 WARRANTY

- A. Manufacturer's Special Warranty – Treated Material: Manufacturer agrees to repair, restore, or replace columns that fail in materials within specified warranty period.
 - 1. Warranty Period: 50 years from the date of Substantial Completion.
 - 2. Manufacturer shall repair treated structural columns that fail because of insect damage or because of decay that occurs under normal conditions and proper use. If manufacturer is not able to repair structural posts to satisfaction of Architect and Owner, manufacturer shall replace damaged treated structural columns.
- B. Special Warranty on Metal Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes the following:
 - a. Color fading more than 5 Hunter units when tested per ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested per ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: From date of Substantial Completion, 50 years on chalk; 30 years on color change, Soffit: Fifty (50) year lifetime limited, non-prorated, transferable warranty.
 - 3. Warranty Exclusions: Manufacturer will not warrant metal panel finishes damaged due to exposure to atmospheric pollutants including animal waste or other corrosive conditions. Manufacturer will not warrant labor by others.
 - 4. Manufacturer shall repair painted steel roofing or siding panels if the paint peels, cracks, checks, flakes or blisters to an extent that is apparent by ordinary outdoor visual observation when exposed to normal weather and atmospheric conditions. If

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manufacturer is not able to repair steel panels to satisfaction of Architect and Owner, manufacturer shall replace damaged steel panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Basis of Design: 40'W x 320'L x 16'H (Truss Bearing)/ 48'W x 80'L x 16'H (Truss Bearing) Pole Building.**

- B. Subject to compliance with requirements, provide products from the following manufacturer:

Stoltzfus Builders
50 Northview Dr
Lititz, PA 17543

Contact: Eli Stoltzfus

Phone: 717.664.3540
Fax: 717.665.7540
stoltzfusbuilders@dejazzd.com
www.stoltzfus-builders.com

Pioneer Pole Buildings
716 Route 183 South
Schuylkill Haven, PA 17972
Local: 570-739-0078 ext. #141
Toll Free: 1-888-448-2505
Fax: 1-888-448-2515

Contact: Heather Evans
hevans@pioneerpolebuildings.com
<https://pioneerpolebuildings.com/>

Energy Panel Structures, Inc.
102 East Industrial Park
Graettinger, IA 51342

Toll Free: 800.967.2130
Fax: 712.859.3275
Email: sales@epsbuildings.com
Website: www.epsbuildings.com

- C. Or Approved Equal.

2.2 PERFORMANCE CRITERIA

- A. Design Requirements:
1. Design wood members per formulas published in National Design Specifications (NDS) for Wood Construction.
 2. Design light meta-toothed connector plates and joint design in compliance with Truss Plate Institute's (TPI) National Design Standard for Metal Plate Connected

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Wood Truss Construction.

3. Include unbalanced roof loads required by ASCE-7, current edition.

2.3 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC3b for exterior construction not in contact with ground and Use Category UC4a for items in contact with ground.
 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
 2. For exposed items indicated to receive stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Maximum moisture content of 19 percent or per appropriate grading rules. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of inspection agency approved by ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 1. Laminated columns.
 2. Baseboards.
 3. Hold down blocks.

2.4 MATERIALS - WOOD

- A. LAMINATED FOUNDATION POSTS AND FOUNDATIONS:
 1. Factory-fabricated from minimum 3 ply, 2 inch by 6-inch glu-laminated, poles 8' on center.
 - a. #1 or better southern yellow pine (or Doug Fir), Kiln dried to 19% moisture content.
 2. Columns to 20 Feet Lengths: Full-length (unspliced) nail laminated plies. Provide middle ply with short truss support block.
 3. Columns over 20 Feet Lengths: Spliced laminated plies per approved Shop Drawings and manufacturer's design.
 4. Preservative-Treatment: Foundation posts shall be pressure treated with a wood preservative to a retention of 0.8 pounds per cubic foot and kiln dried after treating to 19% maximum moisture content. The wood preservative shall be Chromated Copper Arsenate Type III, Oxide type; or equal as listed in Federal Specification TT-W-571J. The preservative shall penetrate 100% of the sapwood. A letter of certification from the wood preserver shall be furnished with certifies the 0.8 pcf preservative retention for a 0 to 0.75" assay zone.
 5. Posts can be solid sawn, mechanically laminated, glue laminated or wood composite however all methods must meet the intended allowable design stresses and be treated for members in contact with the earth.
 6. The foundation posts shall be accurately placed and shall extend 4'-0" minimum below grade. The base of the post shall have (2) 2x6x20", nailed to the 5 1/2" face of the posts (3-20d common each side) and shall have a 2x10x20" base nailed to the underside of the posts and 2x6s.
 7. Base of post shall be set on a precast or cast in place foundation. The foundation shall have a minimum of 3,000 psi compressive strength concrete mix. The foundation shall bear on undisturbed soil.
 8. Foundation size shall be determined from applied structural loads and 2,000 psf presumptive soil bearing capacity. After accurate placement of foundation and posts, the hole shall be backfilled with dry, debris-free dirt compacted in 8" lifts.

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- B. LAMINATED UPPER POSTS:
 - 1. No. 1- No. 2 or better, Southern Pine (or Doug Fir), nail and glue laminated repetitive S4S members of 19% maximum moisture content shall be sized according to dimensions of structure and required structural loads.
- C. FOUNDATION POST TO UPPER POST CONNECTION:
 - 1. The foundation post to upper post connection to be adequate for all imposed bending and axial forces.
- D. SPLASH BOARDS:
 - 1. Splashboards are No. 1- No. 2 or better, Southern Pine (or Doug Fir), nominal 2x8 S4S pressure treated to a net retention of 0.6 pounds per cubic foot with MCQ in accordance with American Wood Preservers Association Specification C2, with barrier tape.
- E. EAVE BOARD:
 - 1. Sidewall eave boards (top plate) shall be 2x12 No. 2 Spruce-Pine-Fir or better and shall be placed on each side of the Post.
- F. SPECIFICATION FOR METAL PLATE CONNECTED WOOD TRUSSES:
 - 1. Trusses 4' on center, pre-engineered, with loading that exceeds State Building Code, minimum 2 x 6 top and bottom chord.
 - 2. All lumber used in the design of wood trusses must be cured and graded in accordance with the current grading rules. Design stresses allowed are those listed in the current editions of respective lumber association's grading rules.
 - 3. The design of wood members must be in accordance with the formulas published in the current edition of the National Design Specification for Wood Construction.
 - 4. Metal connector plates and joint design must conform to specifications as set forth in the current edition of the recommended design practice of the Truss Plate Institute, Inc. Entitled Design Specification for Metal Plate Connected Wood Trusses (TPI-95).
 - 5. Truss members and joints must be designed in accordance with TPI-95. All trusses Designs must be accompanied by complete and accurate shop drawings bearing the seal of a Professional or Structural Engineer, registered in the project State, and contains the following information:
 - a. Slope of depth, span and spacing of the truss.
 - b. Location of all joints.
 - c. Bearing width.
 - d. Design loading to include, as applicable:
 - 1) Top chord live load.
 - 2) Top chord dead load.
 - 3) Bottom chord live load.
 - 4) Bottom chord deal load.
 - 5) Concentrated loads and their points of application
 - e. Adjustments to lumber and plate design vales to include modification for, as Applicable:
 - 1) Moisture service conditions.
 - 2) Temperature.
 - 3) Preservative treatment.
 - 4) Fire retardant treated wood.
 - 5) Duration of load.
 - 6) Flexure.
 - 7) Shear.
 - f. Each reaction force.
 - g. Each axial force (Heel panel axial forces shall not exceed 25,000#)
 - h. Lateral bracing requirements:

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- 1) Top chord brace (roof purlins) spacing.
 - 2) Bottom chord brace spacing.
 - 3) Web bracing, as applicable.
 - i. Plate type, thickness or gauge, size; basic plate design value (specifying gross or Net value); and the dimensioned location of each plate except where symmetrically located relative to the joint interface.
 - j. Lumber size, species, and grade for each member.
- G. Wall Girts: Wall girts shall be 2x4 (unless noted) No. 2 Southern Pine, 19% maximum moisture content spaced approximately 24" o.c., with all ends bearing into wide face of post.
- H. Purlins and Truss Ties: 2 inch by 4 inch laid on edge, MSR SPF 1650.
 - 1. Purlins may be installed over top chord of truss, flat, or in purlin hangers. Where purlins and truss ties are set in hangers, provide 2 inch by 6 inch laid on edge, MSR SPF 1650 or No. 1 or better Southern yellow pine.
 - 2. Continuous 2x4 lateral bracing shall be provided as required in truss specification.
- I. Overhang Framing: Fabricated rafter frames.
 - 1. Provide factory beveled fascia boards, 2 inch by 6 inch Spruce-pine-fir, No. 2.
- J. Wind Bracing:
 - 1. 2 inch by 6 inch, No. 2 or better Spruce-pine-fir from end wall column to first truss back.
 - 2. 2 inch by 4 inch diagonal in roofline bracing as required by design.
- K. Framing Around Openings:
 - 1. Provide 2 inch by 6 inch, No. 2 around door, window, and overhead sectional door openings.
 - 2. All openings shall be framed to proper size and trimmed to cover all exterior edges with pre-painted flashings.
- L. Headers: Provide built-up No. 1 or better Southern yellow pine headers as required to meet loading designs.
- M. Incidental Framing: No.2 or better 2 inch by 4 inch.

2.5 MATERIALS – PREFINISHED MATERIALS

- A. General: Factory-formed metal panels, roll-formed in manufacturer's facility, designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners at side laps. Include accessories required for weathertight installation.
- B. Metal Panels: Exposed-fastener metal roof and wall panels, formed with raised ribs and recesses.
 - 1. Material: Zinc-coated (galvanized) steel sheet:
 - a. Siding: 28 Gauge Frontier Panel 50 Year Warranty
 - b. Roofing: 27 Gauge Frontier Panel 50 Year Warranty - direct screw to purlins.
 - c. Exterior Finish: Siliconized polyester.
 - d. Color: Selected by Architect from manufacturer's full range.
 - 2. Rib Spacing: 2 major ribs at 9 inches on center. 2 minor ribs at 3 inches on center between major ribs.
 - 3. Panel Coverage: 36 inches.
 - 4. Panel Height: 3/4 inch.
 - 5. Insulated Roof/Ceiling with liner panel.

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6. Insulated Wall with liner; liner panel at exterior and demising walls.
- C. Metal Trim: Match material and color of metal panels. Provide trim for corners, ridge lines, rakes, eaves, and panel bases.
1. Provide trim pieces as detailed on manufacturer's installation manual and as required for complete, weather tight, functional installation. Trim shall be 0.0158-inch min. thickness steel on gables, ridge, corners, base, windows, and doors with same paint finish as roofing and siding panels.
 2. Aluminum Trim: Fabricate from same material as soffit to shape, dimensions, and profile required to accommodate soffit panel and project conditions. Provide with channels to receive panels, flanges for concealed weather tight attachment, and slotted attachment holes. Color shall match or coordinate with soffit color. In order to eliminate or minimize visible joints, form in longest possible lengths with 10 feet being minimum.
 3. J-channel: ½ inch wide channel to receive soffit panels with ½ inch attachment flange.
 4. Reverse Frieze Molding: F-shaped piece with ½ inch wide channel to receive aluminum soffit panels.
 5. Soffit T-Bar: Double channel to receive two soffit panels with exposed face
 6. Lengths: Minimum 10 feet.
 7. Trim, overhang facias, track covers, and slide door jambs available in building panel covers.
 8. Overhead Sectional Door and Slide Door Jamb Trim: Fabricated from 1 piece up to 10 feet in length.
- D. Soffits and Gables: 24" overhang: Aluminum or steel, vented as required. Colors shall match roof and wall panel colors.
1. Soffits shall be fabricated and installed to withstand positive and negative wind pressure loads in accordance with applicable codes.
 2. Soffit system to accommodate without damage to components or failure of weather barrier movement caused by seasonal temperature cycling and deflection of structural support framing.
 3. Moisture entering or condensation occurring within soffit system shall drain to exterior.
 4. Type: Fully vented, hi-tensile, double V-groove soffit panel with installation flanges along both edges.
 - a. Dimensions: 24 inches exposed width by 144 inches long.
 - b. Thickness: 0.016 inches.
 - c. Profile: V-grooves forming three (3) 4-inch wide panels with all panels vented.
 - d. Net Free Open Area: 11.6 square inches per linear foot.
 - e. Surface: Smooth.
 - f. Finish Color: White
 5. Materials: Fabricate soffit panels and trim from sheet aluminum complying with ASTM B 209, AA3000 Alloy:
 - a. Minimum Aluminum Properties:
 - b. Ultimate Strength: 25 KSI.
 - c. Yield Strength: 22 KSI.
 - d. Modulus of Elasticity: 10,000 KSI.
 - e. Coefficient of Linear Thermal Expansion: 1.31×10^{-5} inch/inch/degree F.
 - f. Melting Range: 1175 to 1210 degrees F.
- E. Ridge Vent: Manufacturer's standard pre-engineered Universal Ridge Vent, 130 ft., flashings, and eave and gable trim. Field-fabricate minor flashings as indicated on approved Shop Drawings.
1. Provide manufacturer's standard ridge vents as indicated on Drawings

2.6 RELATED MATERIALS

- A. Insulation: Faced, Glass-Fiber Blanket Insulation: ASTM C665, Type I; passing ASTM E136 for combustion characteristics.
 - 1. Surface Burning Characteristics per ASTM E84:
 - a. Flame Spread: 25.
 - b. Smoke Developed: <50.
 - 2. Thermal Resistance and Thickness: R-19, 6 inch in exterior walls, R-30, 10" in roof/ceilings (bottom chord of truss).
 - 3. See Specification Section 072130 – Batt insulation for additional information.
- B. Concrete Floor Slab:
 - 1. 6" thick concrete floor, 4,000 PSI with wire mesh.
 - 2. Provide 6" thick concrete slab throughout interior with expansion joint / thermal break at doors.
 - 3. Provide continuous apron full perimeter, exterior.
- C. Roof Gutters and Downspouts:
 - 1. Gutter: 6" K-style, w/ Downspouts, 3 x 4" rectangular
- D. Walk Doors: Where indicated on Drawings, provide the following type of doors:
 - 1. See Specification Section 081100 – FRP Flush Doors and Aluminum Framing Systems.
- E. Overhead Doors: Size nom. 12'-0"W x 12'-0"H and 12'-0"W x 14'-0"H: Where indicated on Drawings, provide insulated overhead doors, quantity and size as indicated on drawings.
 - 1. C.H.I. Overhead Doors; model no. 3285 or approved equal; insulated with Raynor ControlHoist Standard Commercial Operator; trolley type; ceiling mounted; 1/2HP; overhead doors at Building A are manually operated.
 - 2. Thermally insulated aluminum frame and faced sandwich panels construction, with electrostatically coated enamel paint finish.
 - 3. Track: 2"; 15" Radius
 - 4. Hinges: 11 Gauge
 - 5. 2" short stem steel ball bearing rollers
 - 6. Vision Panels: 34" x 16"; 1/2" insulated glass
 - 7. Mounting: standard bracket mount
 - 8. Color: as selected by architect
 - 9. Cycles: 25,000
 - 10. Remote Operators: provide (2) remoted operators for each motorized door location
- F. Windows/Entrance Framing: Where indicated on Drawings, provide the following type of windows:
 - 1. See Specification Section 084100 – Aluminum Entrances and Storefronts.
- G. Closure Strips: Closed cell, 2 psf density polyethylene foam, premolded to match configuration of panels.
- H. Snow Guards: Provide with Snow Guards on roof.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners with

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- hot-dip zinc coating complying with ASTM A153.
- 2. Exposed Fastener Heads: Match color of steel panel.
- 3. Where steel panels or trim is attached to preservative-treated lumber, provide fasteners of unpainted Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F1667.
 - 1. Framing Lumber: 10d, 16d and 60d ring shank nails.
 - 2. Machine Bolts: Minimum grade 1, A307.
 - 3. Metal Panels: Minimum 1-1/2 inch No. 10 screw fasteners with EPDM sealing washers bearing on weather side of metal panels.
 - a. Match color of metal panels.
- C. Sealants: Silicone type as recommended by soffit manufacturer.

2.8 FABRICATION

- A. Shop Fabricated Plate Connected Wood Trusses:
 - 1. Shop-fabricate wood trusses in TPI inspected plant.
 - 2. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
 - 3. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
 - 4. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1.
 - 5. Position members to produce design camber indicated.
 - 6. Fabricate wood trusses within manufacturing tolerances in TPI 1.
 - 7. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 PRODUCT HANDLING

- A. Deliver components in manufacturer's protective cartons clearly labeled as to specific products contained.
- B. During delivery and storage keep cartons flat and supported along entire length.
- C. Store material off ground, out of weather, in dry place. Provide ventilation. Protect from falling objects and construction activities.
- D. Handling: Avoid gouging, scratching, and denting.

3.2 EXAMINATION

- A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.

- C. Engage land surveyor to perform surveying.
- D. Verify that mechanical and electrical utilities are in correct position.
- E. Proceed with erection only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent framing, connections, and bracing are in place unless indicated otherwise.

3.4 ERECTION OF FRAMING

- A. General: Do not use materials that are unsound, warped, improperly finished, or with defective surfaces, sizes, or patterns.
 - 1. Comply with frame manufacturer's approved Shop Drawings for details and building erection.
 - 2. Comply with NFBA document "Accepted Practices for Post-frame Construction Framing Tolerances."
- B. Columns:
 - 1. Auger hole to depth of diameter indicated on Drawings.
 - 2. Pour ready mix concrete pad in bottom of each hole per Drawings.
 - 3. Install hold down blocks at bottom of each column per approved Shop Drawings.
 - 4. Accurately position column in hole.
 - 5. Backfill with dry soil compacted in 8-inch lifts.
- C. Baseboards: Install 2 runs of 2 inch by 8-inch tongue-and-groove plank, at grade, using manufacturer recommended fasteners.
- D. Wall Girts: Install at centers indicated on Drawings.
 - 1. If required, install overhang framing at top of wall girts.
- E. Trusses:
 - 1. Set trusses in place in center of column using lifting methods as approved by manufacturer.
 - 2. When trusses are properly positioned, install 1/2 inch by 5-1/2-inch machine bolt and manufacturer recommended 20d ring shank nails through 2 of column laminates and truss heel.
 - 3. Brace trusses per WTCA guidelines and BCSI Manual
- F. Purlins: Install purlins with fasteners and at spacings per approved Shop Drawings.
- G. Truss Ties: Install truss ties at locations recommended by structure manufacture and per approved Shop Drawings
 - 1. Run truss ties from end wall to end wall.
- H. Incidental Framing: Install 2 inch by 4 inch or 2 inch by 6 inch blocking as required per structure manufacturers recommendations.

3.5 METALS INSTALLATION, GENERAL

- A. Install metal panels per manufacturer's established construction procedures.

- B. Install metal panels and components plumb, square, straight, and true to lines, and to assure freedom from rattles.
- C. Take care when cutting prefinished materials to ensure cuttings do not remain on finished surface.
- D. Properly install fasteners taking care to not under- or overdrive.

3.6 METALS INSTALLATION

- A. Field Cutting: Accurately measure and cut soffit panels and trim. Use power circular saw with 10-point aluminum cutting blade, duckbill sheet metal snips, or hacksaw as recommended by manufacturer for specific cutting operation.
- B. Trim: Prior to installing soffit panels, locate and anchor perimeter to receive channels. Install trim items at base, corners, top of steel siding, fascia, gables, and ridges using no less than 1 inch screw fasteners.
- C. Wall Panels: Install metal panels perpendicular to wall girt and purlin supports, aligned level and plumb. Anchor with fasteners at spacings recommended by manufacturer and design loads.
- D. Soffit Panels:
 - 1. Layout panels as detailed on approved shop drawings. Provide vented panels to provide sufficient ventilation of space above soffit. A combination of solid and perforated soffits shall be provided for balanced ventilation at side overhangs.
 - 2. Insert panel into receiver channel, flex panel, and insert other end into opposing receiver channel. Ensure panels are perpendicular to perimeter and aligned. Fasten panel to supports by nailing through attachment flanges.
 - 3. Overlap, engage, and lock subsequent panels over preceding ones.
 - 4. At corners, miter cut soffit panels and install with soffit T-bar. Align joints and grooves of intersecting panels.
- E. Expansion Joints: Where soffit panel engages receiver channel and where aluminum components butt or adjoin other materials, leave expansion gap:
 - 1. Hot weather with aluminum components partially expanded: 1/16 inch.
 - 2. Cold weather with aluminum components partially contracted: 1/8 inch.
- F. Fastening: Install panels and trim with nails. Where exposed, use trim nails with color to match aluminum components.
 - 1. Drive fasteners straight and level. Do not slant fasteners.
 - 2. Do not drive head of fastener tightly against attachment flange. Allow 1/32 inch clearance between fastener head and aluminum surface.
 - 3. Do not place fastener through face of soffit panel.
 - 4. Spacing: Fasten soffit panels at 24 inches maximum.
- G. Sealants: Apply sealants where indicated on manufacturer's approved shop drawings and as required to provide weather tight installation. Depth of sealant bead shall be ¼ inch minimum.
- H. Roofing Panels: Install panels perpendicular to supports aligned straight with end fascias and fasten to purlins. Anchor with fasteners at spacings recommended by manufacturer and design loads.

- I. Vented Ridges: Fasten vented ridges to structure as indicated on Drawings, maintaining manufacturer's minimum clear throat opening.
- J. Closure Strips: Provide closure strips at top and bottom of roofing panels.
 - 1. 1" wide closed-cell linked expanded polyurethane, to match panel corrugation.

END OF SECTION

SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

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. Grout.
 - 7. 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.

SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

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.

SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

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. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. 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.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. 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 (or equal):
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Company.

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- 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 (or equal):
 - 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 (or equal):
 - 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 (or equal):
 - 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 (or equal):
 - 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 (or equal):
 - a. Advance Products & Systems, Inc.

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- 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.

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.

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2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems. All exposed piping in food working areas shall be stainless steel.
- 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.
 - i. All exposed escutcheons in the food working areas shall be stainless steel.

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- 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.

SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

- 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.

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 GROUTING

- A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.

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- G. Place grout around anchors.
- H. Cure placed grout.

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 plumbing piping Sections for specialty valves applicable to those Sections only.
 - 2. 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.

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

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.
- 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. Gear Actuator: For quarter-turn valves NPS 8 and larger.
 - 2. Handwheel: For valves other than quarter-turn types.
 - 3. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.
 - 4. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug-valve head.
- E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
 - 1. Gate Valves: With rising stem.
 - 2. 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:

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, or are equal 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, or are equal 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, or are equal to, the following:
 - a. Conbraco Industries, Inc.; Apollo Valves.
 - b. Crane Co.; Crane Valve Group; Crane Valves.

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- 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, or are equal 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.

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- 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, gate, or plug valves.
 - 2. Throttling Service: Globe 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. For Copper Tubing, NPS 5 and Larger: Flanged ends.
 - 4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
 - 5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 6. For Steel Piping, NPS 5 and Larger: Flanged ends.

3.5 DOMESTIC, HOT- AND COLD-WATER, COMPRESSED AIR 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.

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 engineer. 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.

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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 (or equal):
 - 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

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

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 (or equal):
 - 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.

2.5 THERMAL-HANGER SHIELD INSERTS

- A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.
- B. Available Manufacturers (or equal):
 - 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 (or equal):
 - a. Hilti, Inc.
 - b. ITW Ramset/Red Head.
 - c. Masterset Fastening Systems, Inc.
 - d. MKT Fastening, LLC.
 - e. Powers Fasteners.

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- 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 (or equal):

- 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 (or equal):

- 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:

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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:

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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).

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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:

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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 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.
- G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- 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.

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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. Insert Material: Length at least as long as protective shield.
6. 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

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Warning signs and labels.
 - 2. Pipe labels.
 - 3. Valve tags.
 - 4. 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 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: Black.
- C. Background Color: White.
- 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.

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- 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.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.2 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.

2.3 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.

2.4 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: Orange.
 - b. Letter Color: Black.
 - 3. Storm Drainage 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.

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- 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

SECTION 220700 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. 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.

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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, or are equal 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, or equal to, 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

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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, or are equal 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, or are equal 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, or are equal 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, or are equal to, the following:
 - a. Dow Chemical Company (The); 739, Dow Silicone.

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- 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, or are equal 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, or are equal 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, or are equal to, the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.

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- 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.

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- 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.

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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.

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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.

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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. All insulated piping in the food preparation areas shall have stainless steel insulation covering.
- 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 Water:

1. Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

END OF SECTION

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
 - 2. Specialty valves.
 - 3. Escutcheons.
 - 4. Sleeves and sleeve seals.
 - 5. Wall penetration systems.

1.3 SUBMITTALS

- A. Product Data: For the following products:
 - 1. Specialty valves.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Escutcheons.
 - 5. Sleeves and sleeve seals.
 - 6. Water penetration systems.
- B. Water Samples: Specified in "Cleaning" Article.
- C. Field quality-control reports.

1.4 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.
- B. Soft Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A) water tube, annealed temper.

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1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

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 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, or are equal 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, or are equal 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.

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- c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

2.5 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.
- I. Food Preparation Areas: Escutcheons shall be stainless steel.

2.6 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.

2.7 SLEEVE SEALS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, or are equal 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.

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2.8 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 piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- G. 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.
- H. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- I. Install piping adjacent to equipment and specialties to allow service and maintenance.
- J. Install piping to permit valve servicing.
- K. 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.
- L. Install piping free of sags and bends.
- M. Install fittings for changes in direction and branch connections.

3.2 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

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- 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," "Braze 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. 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 valves for piping NPS 2 and smaller. Use ball valves for piping NPS 2-1/2 and larger.
- C. Install calibrated balancing valves in each hot-water circulation return branch. Set calibrated balancing valves partly open to restrict but not stop flow. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for calibrated balancing valves.

3.4 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.
- C. Dielectric Fittings for NPS 2-1/2 and Larger: Use dielectric flanges.

3.5 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.

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- 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.
- 3.6 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 on Plumbing Fixture Schedule on drawings 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.
- 3.7 ESCUTCHEON INSTALLATION
- A. Install escutcheons for penetrations of walls, ceilings, and floors.
 - B. Escutcheons for New Piping:
 - 1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
 - 2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.

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3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
4. Bare Piping in Unfinished Service Spaces: One piece, cast brass with polished chrome-plated finish cast brass with rough-brass finish.
5. Bare Piping in Equipment Rooms: One piece, cast brass.
6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

3.8 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. Seal space outside of sleeves in concrete slabs and walls with grout.
- G. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.
- H. 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 Exterior Concrete Walls:
 - a. Steel pipe sleeves for pipes smaller than NPS 6.
 - b. Cast-iron wall pipe sleeves for pipes NPS 6 and larger.
 - c. Install sleeves that are large enough to provide 1-inch annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.
 6. Sleeves for Piping Passing through Interior Concrete Walls:

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- a. Steel pipe sleeves for pipes smaller than NPS 6.
 - b. Galvanized-steel sheet sleeves for pipes NPS 6 and larger.
 - I. 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.
- 3.9 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.
- 3.10 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.
- 3.11 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.
 - C. Piping Tests:
 - 1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - 2. 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.
 - 3. 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.

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4. 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.
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 for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.12 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. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.13 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.

3.14 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.

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- B. Fitting Option: Brazed joints may be used on aboveground copper tubing.
- C. 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.

3.15 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 all piping.
 - 3. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
 - 4. 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 for soil, waste, and vent piping inside the building:
 - 1. Pipe, tube, and 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.

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.
- 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, or are equal 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 (or equals):
 - 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 (or equals):
 - 1) Clamp-All Corp.
 - 2) Ideal Div.; Stant Corp.
 - 3) Mission Rubber Co.
 - 4) Tyler Pipe; Soil Pipe Div.

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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).

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.

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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. Hubless cast-iron soil pipe and fittings; heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.
 3. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints as allowed by the state plumbing code.
 4. 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 cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- C. 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."
- D. 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."
- E. 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.
- F. 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.
- G. Install soil and waste drainage and vent piping at the State Plumbing Codes minimum slopes.
- H. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- I. Install PVC soil and waste drainage and vent piping according to ASTM D 2665 and state plumbing code.
- J. Install underground PVC soil and waste drainage piping according to ASTM D 2321 and state plumbing code.

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- K. 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.

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.

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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 steel piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4: 84 inches with 3/8-inch rod.
 2. NPS 1-1/2: 108 inches with 3/8-inch rod.
 3. NPS 2: 10 feet with 3/8-inch rod.
 4. NPS 2-1/2: 11 feet with 1/2-inch rod.
 5. NPS 3: 12 feet with 1/2-inch rod.
 6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
 7. NPS 6: 12 feet with 3/4-inch rod.
 8. NPS 8 to NPS 12: 12 feet with 7/8-inch rod.
- H. Install supports for vertical steel piping every 15 feet.
- I. Install hangers for stainless-steel piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 2: 84 inches with 3/8-inch rod.
 2. NPS 3: 96 inches with 1/2-inch rod.
 3. NPS 4: 108 inches with 1/2-inch rod.
 4. NPS 6: 10 feet with 5/8-inch rod.
- J. Install supports for vertical stainless-steel piping every 10 feet.
- K. 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.
- L. Install supports for vertical copper tubing every 10 feet.
- M. 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.
- N. Install supports for vertical PVC piping every 48 inches.
- O. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

SECTION 221316 - SANITARY WASTE AND VENT PIPING

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.

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.

SECTION 221316 - SANITARY WASTE AND VENT PIPING

3.8 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during the 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

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following sanitary drainage piping specialties:
 - 1. Cleanouts.
 - 2. Floor drains.
 - 3. Through-penetration firestop assemblies.
 - 4. Miscellaneous sanitary drainage piping specialties.

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 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.

1.5 COORDINATION

- A. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

- A. Exposed Metal Cleanouts:

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, or are equal 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, or are equal 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, or are equal 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.

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

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, or are equal 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 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, or are equal 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.

2.4 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.

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

- a. NPS 2: 4-inch-minimum water seal.
 - b. NPS 2-1/2 and Larger: 5-inch-minimum water seal.
- C. Air-Gap Fittings:
- 1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
 - 2. Body: Bronze or cast iron.
 - 3. Inlet: Opening in top of body.
 - 4. Outlet: Larger than inlet.
 - 5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

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 floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 - 1. Position floor drains for easy access and maintenance.
 - 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
 - b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
 - c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
 - 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 - 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- F. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

- G. Assemble open drain fittings and install with top of hub 2 inches above floor.
- H. Install deep-seal traps on floor drains and other waste outlets.
- I. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- J. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- K. Install wood-blocking reinforcement for wall-mounting-type specialties.
- L. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
- M. 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 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.

3.4 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 224000 – PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following conventional plumbing fixtures and related components:
 - 1. Faucets for lavatories and sinks.
 - 2. Toilet seats.
 - 3. Protective shielding guards.
 - 4. Fixture supports.
 - 5. Water closets.
 - 6. Lavatories.
 - 7. 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.

SECTION 224000 – PLUMBING FIXTURES

- 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.

SECTION 224000 – PLUMBING FIXTURES

- 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.

SECTION 224000 – PLUMBING FIXTURES

- 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 toilet seats on water closets.
- L. 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.
- M. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.
- N. 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.
- O. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- P. 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."
- Q. 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."

SECTION 224000 – PLUMBING FIXTURES

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

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Equipment installation requirements common to equipment sections.
 - 2. Painting and finishing.

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, crawlspace, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 QUALITY ASSURANCE

- A. 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.

1.5 COORDINATION

- A. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

- 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.

3.2 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.

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. Valve tags.
 - 6. 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 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.

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- 5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- C. 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: Black.
- C. Background Color: White.
- 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.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches high.

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2.4 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.

2.5 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 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Division 09 Section "Interior Painting."
- B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles, complying with ASME A13.1, on each piping system.
 - 1. Identification Paint: Use for contrasting background.
- 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.

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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 10 feet along each run. Reduce intervals to 5 feet in areas of congested piping and equipment.

D. 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: Orange.
 - b. Letter Color: Black.
3. Natural Gas Piping:
 - a. Background Color: Yellow.
 - b. Letter Color: Black.

3.4 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.

3.5 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. Section Includes:
 - 1. Balancing Air Systems:
 - a. Constant-volume air systems.

1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 60 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Certified TAB reports.
- C. Sample report forms.
- D. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.
 - 3. Application.
 - 4. Dates of use.
 - 5. Dates of calibration.

1.4 QUALITY ASSURANCE

- A. TAB Qualifications: Certified by AABC, NEBB or TABB.
- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- E. Examine test reports specified in individual system and equipment Sections.
- F. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- G. Examine operating safety interlocks and controls on HVAC equipment.
- H. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes the following:
 - 1. Equipment and systems to be tested.
 - 2. Strategies and step-by-step procedures for balancing the systems.
 - 3. Instrumentation to be used.
 - 4. Sample forms with specific identification for all equipment.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 - 1. Airside:
 - a. Duct systems are complete with terminals installed.
 - b. Volume, smoke, and fire dampers are open and functional.
 - c. Clean filters are installed.
 - d. Fans are operating, free of vibration, and rotating in correct direction.
 - e. Automatic temperature-control systems are operational.
 - f. Ceilings are installed.
 - g. Windows and doors are installed.
 - h. Suitable access to balancing devices and equipment is provided.

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3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" or SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
 - 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- C. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- D. Verify that motor starters are equipped with properly sized thermal protection.
- E. Check dampers for proper position to achieve desired airflow path.
- F. Check for airflow blockages.
- G. Check condensate drains for proper connections and functioning.
- H. Check for proper sealing of air-handling-unit components.
- I. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.

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- b. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - c. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
 2. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Report artificial loading of filters at the time static pressures are measured.
 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 4. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
 - B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
 1. Measure airflow of submain and branch ducts.
 2. Adjust submain and branch duct volume dampers for specified airflow.
 3. Re-measure each submain and branch duct after all have been adjusted.
 - C. Adjust air inlets and outlets for each space to indicated airflows.
 1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 2. Measure inlets and outlets airflow.
 3. Adjust each inlet and outlet for specified airflow.
 4. Re-measure each inlet and outlet after they have been adjusted.
 - D. Verify final system conditions.
 1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
 2. Re-measure and confirm that total airflow is within design.
 3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
 4. Mark all final settings.
 5. Test system in economizer mode. Verify proper operation and adjust if necessary.
 6. Measure and record all operating data.
 7. Record final fan-performance data.
- ### 3.6 CONTROLS VERIFICATION
- A. In conjunction with system balancing, perform the following:
 1. Verify temperature control system is operating within the design limitations.
 2. Confirm that the sequences of operation are in compliance with Contract Documents.

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- B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.7 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 10 percent.
 - 2. Air Outlets and Inlets: Plus or minus 10 percent.
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.8 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 - 2. Include a list of instruments used for procedures, along with proof of calibration.
 - 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 - 1. Manufacturers' test data.
 - 2. Field test reports prepared by system and equipment installers.
 - 3. Other information relative to equipment performance; do not include Shop Drawings and Product Data.
- C. General Report Data: In addition to form titles and entries, include the following data:
 - 1. Title page.
 - 2. Name and address of the TAB specialist.
 - 3. Project name.
 - 4. Project location.
 - 5. Architect's name and address.
 - 6. Engineer's name and address.
 - 7. Contractor's name and address.
 - 8. Report date.
 - 9. Signature of TAB supervisor who certifies the report.
 - 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 - 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 - 12. Nomenclature sheets for each item of equipment.
 - 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 - 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 - 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.

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- b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Fan drive settings including settings and percentage of maximum pitch diameter.
 - e. Settings for supply-air, static-pressure controller.
 - f. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
 - 1. Quantities of outdoor, supply, return, and exhaust airflows.
 - 2. Duct, outlet, and inlet sizes.
- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
 - 1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches (mm), and bore.
 - i. Center-to-center dimensions of sheave and amount of adjustments in inches (mm).
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.
 - 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches (mm), and bore.
 - f. Center-to-center dimensions of sheave and amount of adjustments in inches (mm).
 - 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm (L/s).
 - b. Total system static pressure in inches wg (Pa).
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg (Pa).
 - e. Filter static-pressure differential in inches wg (Pa).
 - f. Preheat-coil static-pressure differential in inches wg (Pa).
 - g. Cooling-coil static-pressure differential in inches wg (Pa).
 - h. Heating-coil static-pressure differential in inches wg (Pa).
 - i. Outdoor airflow in cfm (L/s).
 - j. Return airflow in cfm (L/s).
 - k. Outdoor-air damper position.
 - l. Return-air damper position.
- F. Gas-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:
 - 1. Unit Data:

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- a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Fuel type in input data.
 - g. Output capacity in Btu/h.
 - h. Ignition type.
 - i. Burner-control types.
 - j. Motor horsepower and rpm.
 - k. Motor volts, phase, and hertz.
 - l. Motor full-load amperage and service factor.
 - m. Sheave make, size in inches (mm), and bore.
 - n. Center-to-center dimensions of sheave and amount of adjustments in inches (mm).
 2. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in CFM.
 - b. Entering-air temperature in deg F.
 - c. Leaving-air temperature in deg F.
 - d. Air temperature differential in deg F.
 - e. Entering-air static pressure in inches wg.
 - f. Leaving-air static pressure in inches wg.
 - g. Air static-pressure differential in inches wg.
 - h. Low-fire fuel input in Btu/h.
 - i. High-fire fuel input in Btu/h.
 - j. Manifold pressure in psig.
 - k. High-temperature-limit setting in deg F.
 - l. Operating set point in Btu/h.
 - m. Motor voltage at each connection.
 - n. Motor amperage for each phase.
 - o. Heating value of fuel in Btu/h.
- G. Fan Test Reports: For supply, return, and exhaust fans, include the following:
1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches (mm), and bore.
 - h. Center-to-center dimensions of sheave and amount of adjustments in inches (mm).
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches (mm), and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
 - g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

- a. Total airflow rate in cfm (L/s).
- b. Total system static pressure in inches wg (Pa).
- c. Fan rpm.
- d. Discharge static pressure in inches wg (Pa).
- e. Suction static pressure in inches wg (Pa).

H. Instrument Calibration Reports:

1. Report Data:

- a. Instrument type and make.
- b. Serial number.
- c. Application.
- d. Dates of use.
- e. Dates of calibration.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Insulation Materials:
 - a. Flexible elastomeric.
 - b. Mineral fiber.
 - 2. Insulating cements.
 - 3. Adhesives.
 - 4. Mastics.
 - 5. Lagging adhesives.
 - 6. Sealants.
 - 7. Factory-applied jackets.
 - 8. Field-applied fabric-reinforcing mesh.
 - 9. Tapes.
 - 10. Securements.
 - 11. Corner angles.
- B. Related Sections:
 - 1. Division 23 Section "Metal Ducts" for duct liners.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

1.3 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.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.5 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

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- B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.6 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in 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. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, 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.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
 - 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. Insulco, Division of MFS, Inc.; Triple I.
 - b. P. K. Insulation Mfg. Co., Inc.; Super-Stik.

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2.3 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.
 - e. K-FLEX USA.
 - 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).

2.4 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- (0.10-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms (0.013 metric 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.

2.5 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

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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 (75 mm).
 3. Thickness: 11.5 mils (0.29 mm).
 4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch (7.2 N/mm) 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 (75 mm).
 3. Thickness: 6.5 mils (0.16 mm).
 4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. 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 (50 mm).
 3. Thickness: 3.7 mils (0.093 mm).
 4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
 5. Elongation: 5 percent.
 6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

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.

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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. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 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. 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. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

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- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). 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.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. 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 (50 mm).
 - 1. Comply with requirements in Division 07 Section "Penetration Firestopping"irestopping and fire-resistive joint sealers.

3.5 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.

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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.

3.6 MINERAL-FIBER INSULATION INSTALLATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
 - b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) 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 (50 mm) from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) 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 (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and

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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 (75 mm).

5. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches (450 mm) 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- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.7 FINISHES

- A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.
 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.8 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.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, round and flat-oval, supply-air and outside-air duct insulation shall be one of the following:
 1. Flexible Elastomeric: 1 inch thick.

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2. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- B. Concealed, rectangular, supply-air and outside-air duct insulation shall be one of the following:
1. Flexible Elastomeric: 1 inch thick.
 2. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- C. Items Not Insulated:
1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
 2. Factory-insulated flexible ducts.
 3. Flexible connectors.
 4. Vibration-control devices.
 5. Factory-insulated access panels and doors.
- 3.10 INDOOR PIPING INSULATION SCHEDULE
- A. Condensate and Equipment:
1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 3/4 inch thick.
- B. Refrigerant Suction and Hot-Gas Piping:
1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1 inch thick.
- C. Refrigerant Suction and Hot-Gas Flexible Tubing:
1. All Pipe Sizes: Insulation shall be one of the following:
 - a. 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. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:
 - 1. Condensate-drain piping

1.3 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:
 - 1. Condensate-Drain Piping: 200 deg F.

1.4 SUBMITTALS

- A. Welding certificates.
- B. Qualification Data: For Installer.
- C. Field quality-control test reports.
- D. All piping and material shall be new, shall meet "Buy American".

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installers of Pressure-Sealed Joints: Installers shall be certified by the pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.
- B. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
 - 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. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 01.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tubing: ASTM B 88, Type L (ASTM B 88M, Type B).
- B. Annealed-Temper Copper Tubing: ASTM B 88, Type K (ASTM B 88M, Type A).
- C. DWV Copper Tubing: ASTM B 306, Type DWV.
- D. Wrought-Copper Fittings: ASME B16.22.
 - 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. Anvil International, Inc.
 - b. S. P. Fittings; a division of Star Pipe Products.
 - c. Victaulic Company of America.
- E. Copper or Bronze Pressure-Seal Fittings:
 - 1. Housing: Copper.
 - 2. O-Rings and Pipe Stops: EPDM.
 - 3. Tools: Manufacturer's special tools.
 - 4. Minimum 200-psig (1379-kPa) working-pressure rating at 250 deg F (121 deg C).
- F. Wrought-Copper Unions: ASME B16.22.

2.2 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.
- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in Part 3 "Piping Applications" Article.
- C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in Part 3 "Piping Applications" Article.
- D. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in Part 3 "Piping Applications" Article.
- E. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
- F. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - 1. Material Group: 1.1.
 - 2. End Connections: Butt welding.
 - 3. Facings: Raised face.
- G. Schedule 40 Victaulic 107/W107 mechanical grooved pipe coupling and fitting with a minimum 125-pound rating. Install gaskets as recommended by the manufacturer. Piping system shall be rated for minimum of 250 degrees F water temperature. All grooved component must be of one manufacturer.

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2.3 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (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.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, 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/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- F. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

PART 3 - EXECUTION

3.1 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such 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. All offsets, fittings, valves, and accessories required by these specifications, but not specifically indicated or shown shall be furnished and installed as required for system installation.
- B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.

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- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Install drains, consisting of a tee fitting, NPS 3/4 (DN 20) ball valve, and short NPS 3/4 (DN 20) threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- O. Identify piping as specified in Division 23 Section "Identification for HVAC Piping and Equipment."
- P. Reducing fittings shall be used in preference to straight fittings and reducers where possible to eliminate unnecessary joints. Branch connections shall be made by the use of tees or any approved pipe fitting. Weld-o-lets and thread-o-lets may be used in steel piping when the branch size is less than one-half the main size. Eccentric type reducers shall be used in horizontal piping to eliminate air pockets. Either eccentric or concentric reducers may be used in vertical piping. Tapping of "blind" flanges is expressly prohibited.

3.2 CUTTING, FITTING AND PATCHING

- A. Perform all cutting and drilling of masonry, steel, wood or iron work and all fitting necessary for the proper installation of all piping systems.
- B. 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 General Contractor in strict accordance with instructions furnished by the 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 workman skilled in the trade affected (masonry, plastering, painting, etc.).

3.3 INTERIOR PIPING

- A. Install piping parallel to building walls and floors unless indicated otherwise. Arrange piping in groups as neatly as possible and at proper levels, spacing, etc., to avoid interference with other trades, such as electrical, plumbing, heating, ventilating, and structural.
- B. Assemble and install piping without undue stresses and strains. Make provisions for expansion, contraction, and structural settlement. Building structural members shall not be weakened or impaired by cutting or notching, unless adequate provision is made with the approval of the Architect for carrying the structural load.
- C. Furnish and maintain in a clean and protected condition all piping materials, including valves, fittings, and accessories. Clean the inside of all piping materials of dirt, dust, and other foreign material. Protect installed materials from damage and foreign objects with plugs, caps, or covers.
- D. Install valves, traps, operating devices, etc., in a place or position which is accessible for servicing or install access panels, chain operated valves, etc., as required to provide for easy maintenance and use.

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3.4 JOINTING METHODS

- A. Threading. Threads shall be concentric with the outside of the pipe and conform to ANSI B2.1. Apply an approved lubricant or threading tape on male threads only and make joints full and tight. Cross-threaded joints shall be re-threaded and re-made. All burrs and cuttings shall be removed and piping shall be reamed or filed out to not less than the original diameter.
- B. Welding.
 - 1. All welds shall be of sound metal thoroughly fused to the base metal at all points, free from cracks and reasonably free from oxidation blow holes, and non-metallic inclusions. No fins or weld metal shall project within the pipe; and should they occur, they shall be removed. All pipe beveling shall be done by machine, where possible. The surface of all parts to be welded shall be thoroughly cleaned free from paint, oil, rust, or scale at the time of welding, except that a light coat of oil may be used to preserve the beveled surfaces from rust.
 - 2. All pipe and fittings shall be carefully aligned with adjacent parts and this alignment must be preserved in a rigid manner during the process of welding.
 - 3. All welding shall be done in accordance with the welding procedures of the National Certified Pipe Welding Bureau, or any other approved procedure, conforming to the requirements of the ASME Boiler and Pressure Vessel code or the ANSI Code for Pressure Piping. No welder shall be employed on the work who has not been fully qualified under the above specified procedure and so certified by a member of a local chapter of the National Certified Pipe Welding Bureau or similar locally recognized testing authority.
 - 4. Before any pipe welding is performed, the Contractor shall submit to the Architect a copy of his welding procedure specification, together with proof of its qualification.
 - 5. The Architect may require the Contractor, at the Contractor's expense, to cut test coupons to determine whether the welding is satisfactory, and to reweld such test pieces in the line.
 - 6. Each Contractor shall be responsible for the quality of welding done by his organization and shall repair or replace any work in accordance with these Specifications.
- C. Soft Soldering. Tubes and fittings shall be cleaned bright, fluxed, heated until solder is drawn into the joint by capillary attraction and the joint is tight. Soft solder composition shall be 95-5 tin-antimony, Englehard Corp. "Silvabrite 100" or equal, lead-free, ASTM B-32. Flux requirements shall be in strict accordance with manufacturer's recommendations.
- D. Flanging. All flanges shall be made up with meeting faces in a plane perpendicular to the axis of the pipe. Meeting flanges shall have mating flange facings. All gaskets shall be evenly centered between flange faces, with ring gaskets engaging fully upon raised face flanges. Use full faced gaskets for flat face flanges. Flanges shall mate flush and true and bolts shall be tightened uniformly to draw evenly and firmly upon the gasket. Bolting shall conform to ASTM A-307, Grade B.

3.5 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor devices are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet (6 m) long.

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2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet (6 m) or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4 (DN 20): Maximum span, 7 feet (2.1 m); minimum rod size, 1/4 inch (6.4 mm).
2. NPS 1 (DN 25): Maximum span, 7 feet (2.1 m); minimum rod size, 1/4 inch (6.4 mm).
3. NPS 1-1/2 (DN 40): Maximum span, 9 feet (2.7 m); minimum rod size, 3/8 inch (10 mm).
4. NPS 2 (DN 50): Maximum span, 10 feet (3 m); minimum rod size, 3/8 inch (10 mm).
5. NPS 2-1/2 (DN 65): Maximum span, 11 feet (3.4 m); minimum rod size, 3/8 inch (10 mm).
6. NPS 3 (DN 80): Maximum span, 12 feet (3.7 m); minimum rod size, 3/8 inch (10 mm).
7. NPS 4 (DN 100): Maximum span, 14 feet (4.3 m); minimum rod size, 1/2 inch (13 mm).
8. NPS 6 (DN 150): Maximum span, 17 feet (5.2 m); minimum rod size, 1/2 inch (13 mm).
9. NPS 8 (DN 200): Maximum span, 19 feet (5.8 m); minimum rod size, 5/8 inch (16 mm).

D. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4 (DN 20): Maximum span, 5 feet (1.5 m); minimum rod size, 1/4 inch (6.4 mm).
2. NPS 1 (DN 25): Maximum span, 6 feet (1.8 m); minimum rod size, 1/4 inch (6.4 mm).
3. NPS 1-1/2 (DN 40): Maximum span, 8 feet (2.4 m); minimum rod size, 3/8 inch (10 mm).
4. NPS 2 (DN 50): Maximum span, 8 feet (2.4 m); minimum rod size, 3/8 inch (10 mm).
5. NPS 2-1/2 (DN 65): Maximum span, 9 feet (2.7 m); minimum rod size, 3/8 inch (10 mm).
6. NPS 3 (DN 80): Maximum span, 10 feet (3 m); minimum rod size, 3/8 inch (10 mm).

E. Support vertical runs at each floor, and at 10-foot (3-m) intervals between floors.

3.6 PIPE 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.

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- F. Welded Joints: Construct joints according to AWS D10.12/D10.12M, 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.
- H. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.

3.7 ADDITIONAL COMPONENT INSTALLATION

- A. Where reducing fittings and reducers are used and where the ordinary fittings would cause an air pocket, eccentric reducers shall be used. No bushings will be allowed in fittings for reducing sizes.
- B. All horizontal runs of water piping shall be run level except condensate drain piping, which shall be pitched at 1/8" per foot, minimum.

3.8 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
 - 1. Leave joints, including welds, uninsulated and exposed for examination during test.
 - 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 - 3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
 - 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 - 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Inspection And Testing :
 - 1. All tests shall be made in the presence of representatives of the Architect. The Contractor shall notify the Architect and all administrative authorities having jurisdiction over the tests three working days before the tests are to be made. Tests required for individual piping system shall be performed in accordance with each piping system subsection of these Specifications.
 - 2. After piping has been installed and before application of insulation, backfilling, or painting of lines, all piping shall be subjected to pressure and leak tests witnessed by the Architect. Concealed work shall remain uncovered until required tests have been completed, but if necessary, tests on portions of the work may be made and concealed after being proved satisfactory. Before any test is applied, all equipment and instruments shall be disconnected and the lines blanked off. Equipment which is designed and constructed to withstand the test pressure being applied may be left connected during tests, subject to approval by the Architect.
 - 3. In the absence of other requirements, piping systems shall be tested at a pressure of one and one-half times the maximum system operating pressure.
 - 4. All exposed pipes, fittings, valves, and joints shall be carefully examined during the test. Defective joints or connections shall be re-made or repaired. Any cracked or damaged pipe, fitting, valves, or other defective material discovered under test shall be removed and replaced.

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5. After completion and acceptance of the required tests, all valves in the system shall be closed and all equipment and connections used in the test work shall be removed and all openings required in the test work closed in an approved manner.
 6. The Contractor shall furnish the necessary piping, valves, and other required equipment to complete the required tests unless otherwise indicated.
 7. At the time of final inspection of the work performed under the Contract, the piping systems shall be complete in every respect and in perfect operating condition. All surplus materials of every character resulting from the work of this section shall have been removed. Any defects discovered subsequent to final inspection shall be corrected.
- C. At such times as the Architect may direct and before connecting up to equipment, the Contractor shall cap up all openings in the piping and make a complete inspection and test of piping. The Contractor shall notify the Architect in advance so that he can witness the test. A hydrostatic test shall be applied to all parts of the piping systems before concealing any piping. With all openings tightly closed introduce water into the systems until the pressure is 100 pounds per square inch. Without further introduction of water the pressure shall not drop more than 2 pounds per square inch in two hours. Tests may be run in sections if so desired. After the tests have been made all leaks shall be repaired until all such piping shows tight.

END OF SECTION

SECTION 233113 – METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Single-wall rectangular ducts and fittings.
 - 2. Single-wall round ducts and fittings.
 - 3. Sheet metal materials.
 - 4. Sealants and gaskets.
 - 5. Hangers and supports.
- B. Related Sections:
 - 1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
 - 2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated 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. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 QUALITY ASSURANCE

- A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

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 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

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- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- 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 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Ductmate Industries, Inc.
 - b. Lindab Inc.
 - c. McGill AirFlow LLC.
 - d. MKT Metal Manufacturing.
 - e. SEMCO LLC.
 - f. Sheet Metal Connectors, Inc.
 - g. Spiral Manufacturing Co., Inc.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
 - 2. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

SECTION 233113 – METAL DUCTS

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90 (Z275).
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.4 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. 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).
 - 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, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- 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.

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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, sealant shall have 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. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
11. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive or negative.
12. Service: Indoor or outdoor.
13. 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, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

G. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa) and shall be rated for 10-inch wg (2500-Pa) static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

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- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 - 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 round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
- I. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

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3.2 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class C.
 - 3. Conditioned Space, Exhaust Ducts: Seal Class B.
 - 4. Conditioned Space, Return-Air Ducts: Seal Class C.

3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 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 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (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.

3.4 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

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3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Duct System Cleanliness Tests:
 - 1. Visually inspect duct system to ensure that no visible contaminants are present.
 - 2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
 - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.
- C. Duct system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.6 DUCT CLEANING

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
 - 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
 - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Clean the following components by removing surface contaminants and deposits:
 - 1. Air outlets and inlets (registers, grilles, and diffusers).
 - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 - 4. Coils and related components.
 - 5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
 - 6. Supply-air ducts, dampers, actuators, and turning vanes.
 - 7. Dedicated exhaust and ventilation components and makeup air systems.
- D. Mechanical Cleaning Methodology:
 - 1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
 - 2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
 - 3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.

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4. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
5. Provide drainage and cleanup for wash-down procedures.

3.7 START UP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.8 DUCT SCHEDULE

A. Supply Ducts:

1. Ducts Connected to Constant-Volume Air-Handling Units:

- a. Pressure Class: Positive 2-inch wg (500 Pa).
- b. Minimum SMACNA Seal Class: B.

B. Return Ducts:

1. Ducts Connected to Air-Handling Units:

- a. Pressure Class: Positive or negative 2-inch wg (500 Pa).
- b. Minimum SMACNA Seal Class: B.

C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

- a. Pressure Class: Negative 2-inch wg (500 Pa).
- b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.

D. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

- a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
- b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
- c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

- a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm (5 m/s) or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm (5 to 7.6 m/s): 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.

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- 3) Velocity 1500 fpm (7.6 m/s) or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - 4) Radius-to Diameter Ratio: 1.5.
 - b. Round Elbows, 12 Inches (305 mm) <Insert dimension> and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches (356 mm) <Insert dimension> and Larger in Diameter: Standing seam Welded.
- E. Branch Configuration:
- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
 - 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm (5 m/s) or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.
 - c. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

END OF SECTION

SECTION 233300 – AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Manual volume dampers.
 - 2. Turning vanes.
 - 3. Duct-mounted access doors.
 - 4. Flexible connectors.
 - 5. Flexible ducts.

1.3 ACTION SUBMITTALS

- A. 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.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

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1. Galvanized Coating Designation: G90 (Z275).
 2. Exposed-Surface Finish: Mill phosphatized.
- B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- C. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

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. Aire Technologies.
 - b. Flexmaster U.S.A., Inc.
 - c. Flex-Tek Group.
 - d. McGill AirFlow LLC.
 - e. Nailor Industries Inc.
 - f. Ruskin Company.
 - g. Trox USA Inc.
 - h. Vent Products Co., Inc.
 2. Standard leakage rating, with linkage outside airstream.
 3. Suitable for horizontal or vertical applications.
 4. Frames:
 - a. Frame: Hat-shaped, 0.094-inch- (2.4-mm-) thick, galvanized sheet steel.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch (1.62 mm) thick.
 6. Blade Axles: Galvanized steel.
 7. Bearings:
 - a. Oil-impregnated bronze or Molded synthetic.
 - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) 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.

2.4 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. Aero-Dyne Sound Control Co.

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2. CL WARD & Family Inc.
3. Ductmate Industries, Inc.
4. Duro Dyne Inc.
5. Elgen Manufacturing.
6. Hardcast, Inc.
7. METALAIRE, Inc.
8. SEMCO LLC.
9. Ward Industries; a brand 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 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- D. Vane Construction: Single wall.

2.5 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. Aire Technologies.
 2. American Warming and Ventilating; a Mestek Architectural Group company.
 3. Cesco Products; a division of MESTEK, Inc.
 4. CL WARD & Family Inc.
 5. Ductmate Industries, Inc.
 6. Elgen Manufacturing.
 7. Flexmaster U.S.A., Inc.
 8. Greenheck Fan Corporation.
 9. McGill AirFlow LLC.
 10. Nailor Industries Inc.
 11. Pottorff.
 12. Ventfabrics, Inc.
 13. Ward Industries; a brand of Hart & Cooley, Inc.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2 (7-2M), "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."
 1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Vision panel.
 - d. Hinges and Latches: 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.
 - e. Fabricate doors airtight and suitable for duct pressure class.
 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches (300 mm) Square: No hinges and two sash locks.

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- b. Access Doors up to 18 Inches (460 mm) Square: Two hinges Continuous and two sash locks.
- c. Access Doors up to 24 by 48 Inches (600 by 1200 mm): Three hinges Continuous and two compression latches with outside and inside handles.
- d. Access Doors Larger Than 24 by 48 Inches (600 by 1200 mm): Four hinges Continuous and two compression latches with outside and inside handles.

2.6 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. CL WARD & Family Inc.
 - 2. Ductmate Industries, Inc.
 - 3. Duro Dyne Inc.
 - 4. Hardcast, Inc.
 - 5. JP Lamborn Co.
 - 6. Ventfabrics, Inc.
 - 7. Ward Industries; a brand 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 (89 mm) 5-3/4 inches (146 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) 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. (880 g/sq. m).
 - 2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

2.7 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Flexmaster U.S.A., Inc.
 - 2. Flex-Tek Group.
 - 3. JP Lamborn Co.
 - 4. McGill AirFlow LLC.
 - 5. Ward Industries; a brand of Hart & Cooley, Inc.
- B. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene aluminized vapor-barrier film.
 - 1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.
 - 2. Maximum Air Velocity: 4000 fpm (20 m/s).
 - 3. Temperature Range: Minus 10 to plus 160 deg F (Minus 23 to plus 71 deg C).
 - 4. Insulation R-value: Comply with ASHRAE/IESNA 90.1 <Insert value>.
- C. Flexible Duct Connectors:

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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 (75 through 460 mm), to suit duct size.

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.
- 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. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
- 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 duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 1. Upstream and downstream from turning vanes.
 2. Elsewhere as indicated.
- H. Install access doors with swing against duct static pressure.
- I. Access Door Sizes:
 1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
 2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
 3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
- J. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- K. Install flexible connectors to connect ducts to equipment.
- L. Connect diffusers to ducts with maximum 60-inch (1500-mm) lengths of flexible duct clamped or strapped in place.
- M. Connect flexible ducts to metal ducts with draw bands.
- N. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:

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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, 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

SECTION 233346 – FLEXIBLE DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Non-insulated flexible ducts.
 - 2. Insulated flexible ducts.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For flexible ducts.
 - 1. Include plans showing locations and mounting and attachment details.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from installers of the items involved.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- C. Comply with the Air Diffusion Council's "ADC Flexible Air Duct Test Code FD 72-R1."
- D. Comply with ASTM E96/E96M, "Test Methods for Water Vapor Transmission of Materials."

2.2 NON-INSULATED FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Flexmaster U.S.A., Inc.
 - 2. JP Lamborn Co.
 - 3. McGill AirFlow LLC.
 - 4. Thermaflex; a Flex-Tek Group company.
 - 5. Ward Industries; a brand of Hart & Cooley, Inc.

SECTION 233346 – FLEXABLE DUCTS

- B. Non-Insulated, Flexible Duct: UL 181, listed and labeled Class 1, two-ply vinyl film supported by helically wound, spring-steel wire.
 - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
 - 3. Temperature Range: Minus 10 to plus 160 deg F.

2.3 INSULATED FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Flexmaster U.S.A., Inc.
 - 2. JP Lamborn Co.
 - 3. McGill AirFlow LLC.
 - 4. Thermaflex; a Flex-Tek Group company.
 - 5. Ward Industries; a brand of Hart & Cooley, Inc.
- B. Insulated, Flexible Duct: UL 181, listed and labeled Class 1, two-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
 - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
 - 3. Temperature Range: Minus 10 to plus 160 deg F.
 - 4. Insulation R-Value: Comply with ASHRAE/IES 90.1

2.4 FLEXIBLE DUCT CONNECTORS

- A. Clamps listed and labeled as Class 1: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install flexible ducts according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install in indoor applications only. Flexible ductwork should not be exposed to UV lighting.
- C. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.
- D. Install duct test holes where required for testing and balancing purposes.
- E. Installation:
 - 1. Install ducts fully extended.
 - 2. Do not bend ducts across sharp corners.
 - 3. Bends of flexible ducting shall not exceed a minimum of 1.5 duct diameter.
 - 4. Avoid contact with metal fixtures, water lines, pipes, or conduits.
 - 5. Install flexible ducts in a direct line, without sags, twists, or turns.

SECTION 233346 – FLEXABLE DUCTS

F. Supporting Flexible Ducts:

1. Suspend flexible ducts with bands 1-1/2 inches wide or wider and spaced a maximum of 48 inches apart. Maximum centerline sag between supports shall not exceed 1/2 inch per 12 inches.
2. Install extra supports at bends placed approximately one duct diameter from center line of the bend.
3. Ducts may rest on ceiling joists or truss supports. Spacing between supports shall not exceed the maximum spacing per manufacturer's written installation instructions.
4. Vertically installed ducts shall be stabilized by support straps at a maximum of 72 inches o.c.

END OF SECTION

PART 1 - GENERAL**1.1 SUMMARY**

- A. This Section includes the following:
 - 1. Inline backward-inclined centrifugal fans.
 - 2. Centrifugal roof ventilators.

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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Twin City Fan.
 - 2. Green Heck.
 - 3. Penn.
 - 4. Jenco.
 - 5. Cook.
- B. Description: Factory-fabricated, -assembled, -tested, and -finished, direct or belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor, motor starter, and disconnect switch, drive assembly, and support structure.
- C. Housings: Heavy gauge galvanized steel, formed panels to make curved-scroll housings with shaped cutoff; with doors or panels to allow access to internal parts and components.
- D. Backward-Inclined Wheels: Single-width-single-inlet construction with curved inlet flange, backplate, backward-inclined blades welded of aluminum construction.

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- E. 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.
- F. Prelubricated and Sealed Shaft Bearings: Self-aligning, pillow-block-type ball bearings.
 - 1. Ball-Bearing Rating Life: ABMA 9, L10 at 50,000 hours.
- G. 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.
- H. Motors: Comply with requirements in Division 23 Section "Motor Requirements for HVAC Equipment."
 - 1. Enclosure Type: Totally enclosed, fan cooled.
 - 2. Disconnect shall be factory wired to fan motor as standard.

2.2 CENTRIFUGAL ROOF EXHAUSTER, UPBLAST, BELT DRIVE

A. CONSTRUCTION:

- 1. BCRD fan housings shall be constructed of spun aluminum and shall offer finish durability and aesthetic appearance. Fan spinings shall have a rolled bead edge for rigidity. All units have a deep venturi inlet to prevent snow and rain entry into the building. The curb cap shall include prepunched mounting holes for ease of installation. A conduit chase constructed of electrical metallic tubing shall be provided to the motor compartment. The curb base shall have continuously welded corners for maximum leak protection. Lifting lugs shall be provided inside the motor compartment for ease of handling and installation. Fans shall bear a permanently attached nameplate displaying model and serial number of the unit for future identification.

B. MOTOR AND DRIVE ASSEMBLY:

- 1. Motor and drive assembly shall be mounted on vibration isolators to eliminate vibration and noise transmission into the ductwork. Motors and drives shall be mounted out of the exhaust airstream.

C. WHEEL:

- 1. Fan wheels shall be of the centrifugal backward inclined type, constructed of aluminum and containing a matching inlet venturi for optimum unit performance. Wheels shall be statically and dynamically balanced.

SECTION 233416 – CENTRIFUGAL HVAC FANS

D. SHAFT:

1. Fan shafts shall be precision-ground and polished. Shafts shall have a first critical speed of at least 125% of the fan's maximum operating speed.

E. EARINGS:

1. Bearings shall be of the one-piece, pillow block type with relubricable zerk fittings. Bearings shall be designed for air handling service with a minimum L-10 life in excess of 100,000 hours; L-60 500,000 hours at the maximum cataloged operating speed. Bearing mounting plate shall have self-aligning tabs for exact locating and alignment of bearings.

F. DRIVE:

1. Drive assembly shall be constructed of heavy-gauge galvanized steel. Drives shall be sized for a minimum of 150% of driven horsepower. Machined, cast iron motor sheaves shall be adjustable for final system balance.

G. MOTOR:

1. Motors shall be heavy-duty ball bearing type, closely matched to the fan load. All single-phase motors shall contain thermal overload protection. All motors shall be UL and/or CSA recognized. Motor adjustment shall allow precise belt tensioning for optimum belt life and one-person adjustment and servicing.

H. DISCONNECT SWITCH:

1. A NEMA 3R disconnect switch shall be supplied with wiring leading from the motor to the junction box (ODP and TEFC motors).

I. ACCESSORIES:

1. When specified, accessories such as backdraft damper, roof curb, curb hinge, retaining chain, security hasp, NEMA-4 disconnect switch, 2-speed switch, firestat, aluminum bird screen, aluminum insect screen, and special coatings shall be provided by fan manufacturer to maintain one source responsibility.

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.

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- 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.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
 - 1. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

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:
 - a. A-J Manufacturing Co., Inc.
 - b. Anemostat Products; a Mestek company.
 - c. Carnes Company.
 - d. Hart & Cooley Inc.
 - e. Kees, Inc.
 - f. Krueger.
 - g. METALAIR, Inc.
 - h. Nailor Industries Inc.
 - i. Price Industries.
 - j. Raymon-Donco.
 - k. Shoemaker Mfg. Co.
 - l. Titus.
 - m. Tuttle & Bailey.
 - 2. Devices shall be specifically designed for variable-air-volume flows.
 - 3. Material: Steel or Aluminum.
 - 4. Finish: Baked enamel, white.
 - 5. Face Size: 24 by 24 inches (600 by 600 mm) or 12 by 12 inches (300 by 300 mm).
 - 6. Face Style: Three cone, Four cone, or Plaque.
 - 7. Mounting: Surface T-bar.
 - 8. Pattern: Fixed Adjustable.

2.2 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as 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, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

PART 1 - GENERAL**1.1 SUMMARY**

- A. Section includes split-system units consisting of separate evaporator-fan and compressor-condenser components.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. 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.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.3 MAINTENANCE MATERIAL

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Filters: One set(s) for each unit.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE Compliance:
 - 1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
 - 2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Procedures," and Section 7 - "Construction and System Start-up."
- C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.5 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

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1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period:
 - a. For Compressor: One year(s) from date of Substantial Completion.
 - b. For Parts: One year(s) from date of Substantial Completion.
 - c. For Labor: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURES

- A. Manufactures: 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. Mitsubishi Electric & Electronics USA, Inc.
 - 2. Carrier Corporation
 - 3. Fujitsu
 - 4. Or Approved Equal.

2.2 INDOOR UNITS (5 TONS OR LESS)

- A. Concealed Evaporator-Fan Components:
 - 1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
 - 2. Insulation: Faced, glass-fiber duct liner.
 - 3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
 - 4. Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch (2.5 mm); leak tested to 300 psig (2070 kPa) underwater; with a two-position control valve.
 - 5. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
 - 6. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
 - 7. Fan Motors:
 - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
 - c. Wiring Terminations: Connect motor to chassis wiring with plug connection.
 - 8. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
 - 9. Filters: Permanent, cleanable.
- B. Wall-Mounted, Evaporator-Fan Components:

SECTION 238126 – SPLIT-SYSTEM AIR-CONDITIONERS

1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
3. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
4. Fan: Direct drive, centrifugal.
5. Fan Motors:
 - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
 - c. Enclosure Type: Totally enclosed, fan cooled.
 - d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
 - e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
 - f. Mount unit-mounted disconnect switches on exterior of unit.
6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
7. Condensate Drain Pans:
 - a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
 - 1) Length: Extend drain pan downstream from leaving face.
 - 2) Depth: A minimum of 1 inch (25 mm) deep.
 - b. Single-wall, galvanized-steel sheet.
 - c. Double-wall, galvanized-steel sheet with space between walls filled with foam insulation and moisture-tight seal.
 - d. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
 - 1) Minimum Connection Size: 3/4".
8. Air Filtration Section:
 - a. General Requirements for Air Filtration Section:
 - 1) Comply with NFPA 90A.
 - 2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.
 - 3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 - a. Compressor Type: Scroll.
 - b. Two-speed or inverter driven compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
 - c. Refrigerant Charge: R-410A .
 - d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.
3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Mounting Base: Polyethylene or concrete base.

2.4 ACCESSORIES

- A. Control equipment and sequence of operation are specified on drawings.
- B. Thermostat: Wired, functioning to control compressor and evaporator fan, with the following features:
 1. Compressor time delay.
 2. 24-hour time control of system stop and start.
 3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
 4. Fan-speed selection including auto setting.
- C. Automatic-reset timer to prevent rapid cycling of compressor.
- D. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.
- E. Drain Hose: For condensate.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

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B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION

PART 1 - GENERAL**1.1 SUMMARY**

- A. Section includes cabinet unit heaters with centrifugal fans and hot-water electric-resistance heating coils.

1.2 DEFINITIONS

- A. CWP: Cold working pressure.
- B. PTFE: Polytetrafluoroethylene plastic.
- C. TFE: Tetrafluoroethylene plastic.

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 plans, elevations, sections, and details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include location and size of each field connection.
 - 4. Include details of anchorages and attachments to structure and to supported equipment.
 - 5. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
 - 6. Indicate location and arrangement of piping valves and specialties.
 - 7. Indicate location and arrangement of integral controls.
 - 8. Wiring Diagrams: Power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Samples for Initial Selection: Finish colors for units with factory-applied color finishes.
- E. Samples for Verification: Finish colors for each type of cabinet unit heater indicated with factory-applied color finishes.
- F. Operation and Maintenance Data: For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

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. Airtherm; a Mestek company.
 - 2. Berko; Marley Engineered Products.
 - 3. Carrier Corporation; a unit of United Technologies Corp.
 - 4. Chromalox, Inc.

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5. Markel Products; TPI Corporation.
6. Marley Engineered Products.
7. QMark; Marley Engineered Products.
8. Trane.

2.2 DESCRIPTION

- A. Factory-assembled and -tested unit complying with AHRI 440.
- 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 UL 2021.

2.3 PERFORMANCE REQUIREMENTS

- A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- B. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

2.4 COIL SECTION INSULATION

- A. Insulation Materials: ASTM C 1071; surfaces exposed to airstream shall have aluminum-foil facing to prevent erosion of glass fibers.
 1. Thickness: 1/2 inch (13 mm).
 2. Thermal Conductivity (k-Value): 0.26 Btu x in./h x sq. ft. at 75 deg F (0.037 W/m x K at 24 deg C) mean temperature.
 3. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
 4. Adhesive: Comply with ASTM C 916 and with NFPA 90A or NFPA 90B.
 5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.5 CABINETS

- A. Material: Steel with baked-enamel finish with manufacturer's standard paint, in color selected by Architect.
 1. Vertical Unit, Exposed Front Panels: Minimum 0.0528-inch- (1.35-mm-) thick galvanized sheet steel, removable panels with channel-formed edges secured with tamperproof cam fasteners.
 2. Horizontal Unit, Exposed Bottom Panels: Minimum 0.0528-inch- (1.35-mm-) 0.0677-inch- (1.7-mm-) thick galvanized sheet steel, removable panels secured with tamperproof cam fasteners and safety chain.
 3. Recessed Flanges: Steel, finished to match cabinet.
 4. Control Access Door: Key operated.
 5. Base: Minimum 0.0528-inch- (1.35-mm-) thick steel, finished to match cabinet, 4 inches (100 mm) high with leveling bolts.

2.6 FILTERS

- A. Minimum Arrestance: According to ASHRAE 52.1 and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

1. Glass Fiber Treated with Adhesive: 80 percent arrestance and MERV 5.

2.7 COILS

- A. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, mounted in ceramic inserts in galvanized-steel housing; with fuses in terminal box for overcurrent protection and limit controls for high-temperature protection. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.

2.8 CONTROLS

- A. Fan and Motor Board: Removable.
 1. Fan: Forward curved, high static, double width, centrifugal, directly connected to motor; thermoplastic or painted-steel wheels and aluminum, painted-steel, or galvanized-steel fan scrolls.
 2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
 3. Wiring Terminations: Connect motor to chassis wiring with plug connection.
- B. Electrical Connection: Factory-wired motors and controls for a single field connection.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive cabinet unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for piping and electrical connections to verify actual locations before unit-heater installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install wall boxes in finished wall assembly; seal and weatherproof.
- B. Install cabinet unit heaters to comply with NFPA 90A.
- C. Suspend cabinet unit heaters from structure with elastomeric hangers. Vibration isolators are specified.
- D. Install wall-mounted thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

3.3 CONNECTIONS

- A. Comply with safety requirements in UL 1995.
- B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

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- C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
 - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
- B. Units will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust initial temperature set points.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain cabinet unit heaters.

END OF SECTION

PART 1 - GENERAL

1.1 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 2020 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.

1.2 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 edition of the National Electrical Code and in accordance with the manufacturer's recommendations.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.
- C. The term "finished space" shall mean any space designated for the general or specific use of the occupants.
- D. 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.
- E. The term "electrical space" as used in this division of the specifications shall mean any space designated primarily for the installation of electrical equipment.
- F. "Provide" - Furnish and install the specific item, equipment, and/or system.

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- G. "Furnish" - Supply the specific item, equipment, and/or system.
- H. "Install" - Set in position and adjust for use the specific item, equipment, and/or system unless otherwise specifically noted to be installed by others.
- I. "Concealed" - Hidden from sight in walls, chases, furred spaces, above ceilings, underground, in concrete, etc.
- J. "Exposed" - Not hidden from sight.
- K. "Work" - Labor and installation, including materials, equipment, and systems required for completion of all portions of the project.

1.4 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

1.5 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.

1.6 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.

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- C. No roughing-in or connections shall be done until approved equipment submittals are in the hands of the Contractor. It shall be this Contractor's responsibility to obtain approved 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's 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.
- G. Product Data: For sleeve seals and access panels.

1.7 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.

1.8 OPERATION AND MAINTENANCE MANUALS

- A. Operation and maintenance data shall be submitted in accordance with the requirements of Division "GENERAL REQUIREMENTS".
- B. Furnish owner with three (3) bound sets of the O&M manuals at completion of project. The manuals shall be furnished by the manufacturer of each item of equipment or system. Each set is to be bound separately in a loose leaf binder. Manuals shall include Contractor's Name and telephone numbers that can be called for service calls. The standard manufacturer's data shall be supplemented by such special instructions as may be necessary for the particular application. Also, include the following in the manuals:

- All project stamped acceptable shop drawings and copies of all certificates.
 - Lubrication schedules and procedures
 - Spare parts list, indicate all items that should be maintained at the site by owner.
 - Maintenance and trouble-shooting suggestions for equipment.
 - Non-Lien Affidavits

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Wiring Diagrams
Certification of owner instruction of system and equipment
Record drawings
Preventative Maintenance Task Form

- C. The operating instructions shall integrate each piece of equipment in any one system into a numbered step-by-step sequence of operation.
- D. The parts list shall consist of a complete list of replacement items with all component parts numbered for each piece of mechanical or electrical equipment and shall include directions for ordering said replacement items.
- E. Maintenance procedure shall outline required routine maintenance for all equipment and systems and instructions for repair of the equipment.
- F. The Contractor shall, with the aid of his equipment suppliers, fill out the Owner's Preventative Maintenance Task Form. The completed Preventative Maintenance Task Form shall be included in the final copies of the O&M manuals.

1.9 RECORD DRAWINGS

- A. This Contractor shall submit to the Owner one (1) reproducible sepia copy, one (1) print Record Drawings. Drawings shall be identified with the Contractor's name, the date, and title "RECORD DRAWINGS" on the paper copies.

1.10 REMOVALS AND RELOCATIONS

- A. Perform all removal work required. Prepare remaining surfaces to receive new scheduled or specified materials. Finish surfaces to match adjacent if no additional work is scheduled or specified.
- B. Remove existing systems, materials, and equipment which are made obsolete, or which interfere with the construction. Reinstall any such systems, materials, and equipment which are required to complete the Project.
- C. Where existing systems, materials, or equipment are removed or revised, all conduit and wire which are no longer in service shall be removed. When outlets are covered up or are otherwise rendered inaccessible, all wiring shall be removed to the source. If a circuit that must remain in service is interrupted, it shall be reconnected by the most inconspicuous means so that it remains operational, with the same capacity as before. All building surfaces damaged, and openings left by removal of boxes, conduit, or other equipment shall be repaired. All holes left in junction boxes, switches, panels, and other equipment shall be closed.
- D. Where new openings are cut and concealed conduits or other electrical items are encountered, they shall be removed or relocated as required. Where conduit to be removed stubs through floors, walls, and ceilings, such conduit shall be removed to the point where the finished surfaces can be patched so that no evidence of the former installation remains.
- E. All devices, fixtures, equipment, and material determined by the Owner to be salvageable shall remain the property of the Owner and shall be stored at the location on the premises designed by the Owner. All other items and debris shall be disposed of by the Contractor.

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:

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1. Notify Architect no fewer than seven days in advance of proposed interruption of electrical services.
2. Prior to making revisions to the existing services, the Contractor shall make certain that all items are thoroughly prepared. The actual work shall be accomplished at off-peak time as arranged with the Owner and Architect. Once the work is started, it shall be prosecuted to its completion to keep downtime to a minimum. The Contractor shall be prepared to temporarily feed the existing service in the event it becomes impossible to finish the scheduled work on time.
3. The Contractor shall prepare a procedure for all work which will interrupt service to the Owner's equipment. This procedure shall include a step-by-step schedule that the Contractor proposes to follow in the performance of the work and the time involved in each step. The procedure shall be submitted to the Architect for approval at least two weeks in advance of the performance of the work.
4. Indicate method of providing temporary electrical service. Contractor is responsible for providing all temporary electrical services.
5. Do not proceed with interruption of electrical service without Architect's written permission.
6. 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, cables, wireways, and cable trays will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames".
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping".
- E. 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

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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
MCC	MOTOR CONTROL CENTER
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 Concrete shall be 3000 psi and shall comply with the requirements of Division "CONCRETE".

2.3 Compacted aggregate subbase shall conform to ASTM C33, gradation 57.

2.4 Reinforcing steel, welded wire fabric, forms, and curing compounds shall comply with the requirements of Division "CONCRETE". The minimum reinforcement shall be 6 x 6 10/10 welded wire fabric.

2.5 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.

2.6 Bolting shall be carbon steel conforming to ASTM A-307 with heavy hexagonal nuts.

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- 2.7 Angles, Channels, Beams, Bars and Rods shall be steel conforming to ASTM A-36 as applicable.
- 2.8 ACCESS PANELS
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or an approved equal:
1. Nystrom
 2. Inland-Ryerson
 3. Karp Associates
 4. Or approved equal
- B. Fire rated access panels shall be a prime steel door and frame assembly with flush lock release and interior latch release.
- C. Panel shall have a 1½ hour B rating.
- D. Access panels shall be nominal 16 inch by 16 inch, unless noted otherwise.
- 2.9 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.
- 2.10 SLEEVE SEALS
- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or an approved equal:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
 - e. Or approved equal.
 2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 3. Pressure Plates: 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.

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. At penetrations of fire walls provide fire barrier penetration sealing system in conformance with Section FIRESTOPPING. The seal shall also be provided at all floor penetrations in a multi-story building. 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.
- H. 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, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

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1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
 - I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
 - J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
 - K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
 - L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.
- 3.3 SLEEVE-SEAL INSTALLATION
- A. Install to seal exterior wall penetrations.
 - B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- 3.4 FIRESTOPPING
- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."
- 3.5 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.

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3.6 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. Equipment shall be securely anchored in place. Care shall be exercised to correctly orient equipment before securing in place.
- C. Equipment Pads and Grouting
 - 1. Electrical Contractor shall furnish and install concrete pads for all equipment requiring same provided by Electrical Contractor.
 - 2. Floor-mounted equipment such as switchboards and transformers 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 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 3/4 inch larger than the bolts to facilitate alignment of equipment.
 - 3. Pads, unless otherwise directed, shall extend 4 inches above the finished floor and shall be securely anchored to floor so that vibration or stresses cannot cause lateral movement. Unless noted otherwise, install dowel rods on 18 inch centers around full perimeter of base.
 - 4. Where grouting is required, equipment shall be set to level 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.
 - 5. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.
- D. Equipment Mounting.
 - 1. All equipment with moving parts shall be mounted on vibration supports suitable for the purpose of minimizing noise and vibration transmission unless otherwise specified, and in addition, shall be isolated from external connections such as piping and raceways by means of flexible connectors, vibration absorbers, or other approved means.
- E. Platforms and Supporting Stands
 - 1. Each piece of equipment or apparatus suspended from the ceiling or mounted above the floor level shall be provided with suitable structural support, pipe stand, platform, or carrier in accordance with the best recognized practice and as approved by the Architect.
 - 2. Such supporting or mounting means shall be provided by this Contractor for all equipment furnished by him.
 - 3. Structural members of the building shall not be overloaded by such equipment.
- F. 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 TRENCHING AND BACKFILLING

- A. Trenching and backfilling shall be accomplished in accordance with the requirements of Division "SITEWORK" and with the following.

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- B. Underground Electrical Services shall be installed in trenching dug specifically for such services. Layout the trench routing using stakes and flags. Do not proceed with excavation until the layout is approved by the Architect.
- C. The trench shall be dug so that the service shall be laid to the alignment and depth required, and it shall be excavated only so far in advance of installation as can be completed in one day. The width of the trench shall be ample to permit the service to be laid and the backfill to be placed and compacted as specified. The minimum trench width shall be four inches. The minimum trench depth shall be twenty-four inches.
- D. Materials to be excavated shall include earth, rock, or any other material encountered within the limits of trench excavation. No adjustment in the contract price will be made on account of the presence or absence of shale, sandstone, masonry, rock, or other material. The Contractor shall familiarize himself with existing site conditions by examination of the actual site and Contract Documents.
- E. All excavated material shall be piled in a manner which will not endanger the work, and which will avoid obstructing sidewalks and driveways. In general, excavated material shall be piled on the high side of the trench to form a dam to prevent surface water from entering the trench.
- F. The Contractor may use trench digging machinery or employ hand methods but shall employ hand methods in locating underground utilities.
- G. All excavated materials not required or not suitable for backfill shall be disposed of by the Contractor.
- H. Sheet piling and shoring shall be placed as necessary for the protection of the work and for the safety of personnel.
- I. The trench bottom shall be accurately graded to provide a uniform surface for the type of bedding specified. Stones shall be removed as necessary to avoid point bearing.
- J. Whenever wet or otherwise unstable material that is incapable of properly supporting the conduit, duct, or structure is encountered in the bottom of the excavation, such material shall be over excavated to a depth to allow for construction of a stable bedding.
- K. Any over depth excavation shall be backfilled with materials specified for backfilling the lower portions of trenches.
- L. The first six inches of trench depth above the utility shall be backfilled by hand with sand. One hundred percent of this sand shall pass a 3/4 inch screen. Ninety-five percent shall pass a No. 4 screen, and not over eight percent shall pass a No. 100 screen. Tamp this backfill thoroughly, taking care not to disturb the conduit or injure the conduit coating. For the remaining trench depth, the backfill shall be earth or granular material, except that the material may contain stones, rock, concrete, or masonry materials (but no cinders), with a maximum dimension of 4 inches, providing the voids in such coarse material are completely filled with earth or granular material. In the event that sufficient material for trench backfill is not available from trenching or other excavation, the Contractor shall supply and place the requisite additional material.
- M. Backfill shall be thoroughly compacted with an approved mechanical tamper, or, if the soil is of a granular nature, by puddling with hose and long pipe nozzle after the trench is backfilled, provided that under pavements and other surfacing, the backfill shall be compacted solidly in layers not more than 6 inches thick, measured loose, with mechanical tampers.
- N. Compaction requirements - All fill and backfill shall be compacted to the following percent of the maximum density obtained in accordance with ASTM D-1557, Method D (Modified Proctor). Moisture contents shall range from 1% below to 4% above optimum.

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1. Below base of footings - 98%
2. Beneath slabs on grade - 95%
3. Beneath sidewalks and pavement - 95%
4. Backfill against basement walls - minimum compacting required to achieve reasonable consolidation (approximately 80%).
5. Lawns and planting areas - 88%

O. In lawn or planting areas, the top 12 inches of backfill shall be topsoil.

P. **PERMITS, CERTIFICATES, LAWS AND ORDINANCES**

1. The Electrical Contractor shall, at his own expense, procure all 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. Refer to front end specification sections for permit requirements.
2. Following completion, a certificate of approval shall be secured from the local code enforcement authority and delivered to the Architect.

Q. **INSPECTION**

1. 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.

R. **PAINTING**

1. Refinish surfaces marred or damaged by electrical work to original or specified condition.
2. Replace marred or discolored factory, multiple coat, baked on finish surfaces. Minor inconspicuous scratches may be "touched-up". Provide one spray can of each color of touch-up painted used to the Owner.
3. The following items do not require painting.
 - a. Equipment with a factory baked on finish.
 - b. Receptacle and switch cover plates.
 - c. Faceplates of instruments, equipment, and control panels.

END OF SECTION

PART 1 - GENERAL

1.1 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 01 Section "Construction Waste Management."
 - 2. Division 26 Sections:
 - a. "Common Work Results for Electrical"
 - b. "Identification for Electrical Systems"

1.2 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. 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.

1.5 COORDINATION

- A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or an approved equal:
 - 1. American Insulated Wire Corp.; a Leviton Company.
 - 2. General Cable Corporation.
 - 3. Senator Wire & Cable Company.
 - 4. Southwire Company.
 - 5. Carol Cable.
 - 6. Or approved equal.

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

- B. Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN and XHHW.
- D. Multiconductor cabling: Comply with NEMA WC 70 for metal clad cable, Type MC with ground conductor.

2.2 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or an approved equal:
 - 1. AFC Cable Systems, Inc.
 - 2. Hubbell Power Systems, Inc.
 - 3. O-Z/Gedney; EGS Electrical Group LLC.
 - 4. 3M; Electrical Products Division.
 - 5. Tyco Electronics Corp.
 - 6. Or approved equal.
- C. 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 WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway. Feeders shall not be encased within floor slabs.
- E. Exposed Branch Circuit: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway. Metal clad cabling may be used for wiring within room from ceiling down to wall device. Metal clad cabling shall not be used for homeruns or from room to room.

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway. Branch circuits shall not be encased in floor slabs.
- H. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- I. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems".
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems".
- G. Metal clad cabling shall be secured at intervals not exceeding 6 foot and shall be secured within 12 inches of every box, cabinet, fitting, or other termination. Metal clad cable shall be supported by listed cable ties, steps, hangers, or other similar fittings designed for such use. Metal clad cables shall not be supported from ceiling supports or from twisted support wires.
- H. Provide anti short bushings at all metal clad cable terminations.
- I. 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.
- J. No thermoplastic conductors shall be pulled through raceways at ambient temperatures below 33°F.
- K. All insulated bushings shall be installed before pulling conductors.
- L. All wiring in panel gutters, pull boxes, and other accessible enclosures shall be tied and bundled with cable ties.
- M. When channels of LED fixtures are used as a raceway, Type THHN conductors shall be used throughout the fixtures as the branch circuit.
- N. 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.
- O. Feeder cables shall be spliced only at tap points. Splices of any other nature shall not be permitted.

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

- P. 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.
- Q. 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. Splices in handholes and below grade applications shall be waterproof epoxy type.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping".

3.6 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 stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- C. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes grounding systems and equipment, plus the following special applications:
 - 1. Underground distribution grounding.
- B. Related sections include the following:
 - 1. Division 01 Section "Construction Waste Management."
 - 2. Division 26 Section:
 - a. "Common Work Results for Electrical"

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1. Test wells.
 - 2. Ground rods.
 - 3. Grounding arrangements and connections for separately derived systems.
- C. Qualification Data: For qualified testing agency and testing agency's field supervisor.
- D. Field quality-control reports.
- E. Operation and Maintenance Data: For grounding 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. Instructions for periodic testing and inspection of grounding features at test wells grounding connections for separately derived systems.
 - a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
 - b. Include recommended testing intervals.

1.3 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 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.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet in diameter.

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. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 3/0 AWG minimum.
 - 1. Bury at least 24 inches below grade.
- C. Grounding Bus: Install in electrical and IT equipment areas, and elsewhere as indicated.

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

1. Install bus on insulated spacers 1 inch minimum from wall, 6 inches above finished floor unless otherwise indicated.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.

3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- C. Heat-Tracing Cables: Install a separate insulated equipment grounding conductor to each electric heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- D. 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.
- E. Panelboards: Provide ground bushing on each incoming feeder conduit and connect to equipment ground bus.
- F. Transformers: The neutral of each transformer shall be grounded by a separate grounding conductor connected to the grounding transformer.

3.4 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Test Wells: Ground rod driven through drilled hole in bottom of handhole.
1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
- G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

3.5 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 with a calibrated torque wrench according to manufacturer's written instructions.
 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

- a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- 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.
 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 4. Pad-Mounted Equipment: 5 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 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.
- B. Related Sections include the following:
 - 1. Division 01 Section "Construction Waste Management."

1.2 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.
 - 2. Nonmetallic slotted support systems.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Nonmetallic slotted channel systems. Include Product Data for components.
 - 4. Equipment supports.
- C. Welding certificates.

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1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel".
- B. Comply with NFPA 70.

1.6 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 installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07.

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, provide products by one of the following, or an approved equal:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - h. Or approved equal.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 5. Channel Dimensions: Selected for applicable load criteria.
- B. 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. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

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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, provide products by one of the following, or an approved equal:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
 - 5) Or approved equal.
2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or an approved equal:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 - 6) Or approved equal.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted 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.

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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 and communication systems above suspended ceilings and for fastening raceways to trapeze supports.
- E. Where conduit runs vertically, approved riser clamps, brackets, or other means shall be utilized to support conduit at 8 foot center-to-center, maximum.
- F. Single runs of conduit shall be fastened to walls with one-hole straps or conduit clamps and to beams and trusses with beam clamps.
- G. Perforated 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. Raceway Support Methods: In addition to methods described in NECA 1, RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
1. To Wood: Fasten with lag screws or through bolts.
 2. To New Concrete: Bolt to concrete inserts.
 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 4. To Existing Concrete: Expansion anchor fasteners.
 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
 7. To Light Steel: Sheet metal screws.
 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete".
- C. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements in Division 09 Painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
 - 1. Division 01 Section "Construction Waste Management".
 - 2. Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, and underground utility construction.
 - 3. Division 26 Section "Common Work Results for Electrical".
 - 4. Division 26 Section "Hangers and Supports for Electrical Systems" for raceway and box supports.

1.2 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. FMC: Flexible metal conduit.
- E. IMC: Intermediate metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.
- G. LFNC: Liquidtight flexible nonmetallic conduit.
- H. NBR: Acrylonitrile-butadiene rubber.
- I. RNC: Rigid nonmetallic conduit.

1.3 SUBMITTALS

- A. Product Data: For conduit, boxes, wireways and fittings, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Custom enclosures and cabinets.
- C. Qualification Data: For professional engineer and testing agency.
- D. Source 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.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following, or an approved equal:
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.
 10. Or approved equal.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. IMC: ANSI C80.6.
- D. EMT: ANSI C80.3.
- E. FMC: Zinc-coated steel.
- F. LFMC: Flexible steel conduit with PVC jacket.
- G. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
 2. Fittings for EMT: Steel compression type. **Set screw and indentation type fittings are not allowed.**
 3. Fittings for rigid steel conduit shall be threaded.
 4. Expansion fittings shall be galvanized ductile or malleable iron. Rigid conduit expansion fittings shall be DZ/Gedney type AX or approved equal. EMT fittings shall be DZ/Gedney type TX with compression fitting or approved equal.
- H. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following, or an approved equal:
1. AFC Cable Systems, Inc.
 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 3. Arnco Corporation.
 4. CANTEX Inc.
 5. CertainTeed Corp.; Pipe & Plastics Group.
 6. Condux International, Inc.
 7. ElecSYS, Inc.
 8. Electri-Flex Co.
 9. Lamson & Sessions; Carlon Electrical Products.

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10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.
13. Or approved equal.

- B. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- C. LFNC: UL 1660.
- D. Fittings for RNC: NEMA TC 3; match to conduit or tubing type and material.
- E. Fittings for LFNC: UL 514B.

2.3 METAL WIREWAYS

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following, or an approved equal:
1. Cooper B-Line, Inc.
 2. Hoffman.
 3. Square D; Schneider Electric.
 4. Or approved equal.
- B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES AND CABINETS

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following, or an approved equal:
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.
 14. Or approved equal.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

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- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.
- G. Stainless Steel Outlet and Devices Boxes: ASTM A351, CF8M
- H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic.
- I. Cabinets:
 - 1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
 - 1. Exposed Conduit: Rigid steel conduit.
 - 2. Concealed Conduit, Aboveground: Rigid steel conduit or EMT.
 - 3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried, unless noted otherwise.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R. 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 or rigid metal conduit.
 - 2. Exposed and Subject to Severe Physical Damage: Rigid steel conduit or IMC.
 - 3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 - 5. Damp or Wet Locations: Rigid steel conduit or IMC.
 - 6. Boxes and Enclosures: NEMA 250, Type 1 except use NEMA 250, type 4, stainless steel in damp or wet conditions.
 - 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. Swivel aligners shall be provided for all suspended fixtures.
 - 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.

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- 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.
 - 7. Boxes and enclosures in inmate areas: NEMA 250, Type 1. Cast malleable iron with threaded hubs and vellumoid gasket.
 - C. Minimum Raceway Size: 1/2-inch trade size.
 - D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
- 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. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
 - F. 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.
 - G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
 - H. Do not embed raceways in slabs.
 - I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
 - J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
 - K. 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.
 - L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 2. Where otherwise required by NFPA 70.
- M. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
 2. Use LFMC in damp or wet locations not subject to severe physical damage.
- N. 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.
- O. Metallic conduit systems shall be electrically continuous in their entirety.
- P. All conduit shall be capped before concrete is poured.
- Q. Outlet boxes shall be provided for all devices. Pull boxes and junction boxes shall be provided at all points of splicing and tapping.
- R. Boxes shall not be installed back-to-back in any wall but shall be staggered at least 12 inches apart.
- S. 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.
- T. 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.
- U. Outlet boxes in lay-in ceilings shall be supported by bar hangers anchored to the ceiling construction.
- V. 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.
- W. All boxes shall be accessible.
- X. 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.
- Y. Conduit bends and elbows shall be long-sweep, large radii when required by cable manufacturer.
- Z. Utilize grounding/bonding jumpers with u-bolt connections and tinned copper braid at expansion fittings.
- AA. Raceways that pass through insulated metal panels shall be sealed around penetration.
- 3.3 INSTALLATION OF UNDERGROUND CONDUIT
- A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit.
 2. Install backfill as specified.

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified.
4. Install manufactured duct elbows for stub-ups at equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at equipment and at building entrances through the floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches of concrete.
 - b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
6. Warning Tape: Bury magnetic warning tape approximately 12 inches above direct-buried conduits, as specified in Division 26 Section "Underground Ducts and Raceways for Electrical Systems".

3.4 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping".

3.5 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

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 27.
- 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 CABLE RUNWAY

- A. Manufactures: Subject to compliance with requirements, provide products by one of the following:
 - 1. Chatsworth
- B. Materials and Finishes:
 - 1. 1.5 inches high x 0.4 inches wide tubular steel with 0.065 inch wall thickness.
 - 2. 1.5 inch wide cross members welded between the rack stringers on 12 inch intervals.
 - 3. Finishes: Powder coat paint in black.
- C. Fittings:
 - 1. Cable Runway Splices: Mechanically connect rack sections and turns together end-to-end to form a continuous pathway for cables. Finish to match ladder rack.
 - 2. Cable Runway Supports: Sized to match the width of runway that is supported. Finish to match runway.
 - 3. Pathway Dividers: 6.8 inch high x 1.5 inch wide x 2.2 inch deep.
 - 4. Cross Radius Drop and Stinger Radius Drop: 0.060 inch thick steel, 4.6 inches high x 6.1 inches.
 - 5. Cable retaining posts.
 - 6. Cable runway protective end caps.

2.2 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".

2.3 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 and install seismic restraints.
 - 1. Design each fastener and support to carry load indicated by seismic requirements and to comply with seismic-restraint according to Division 26 Section "Vibration and Seismic Controls for Electrical Systems".
 - 2. Place supports so that spans do not exceed maximum spans on schedules.

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- 3. 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.
- 4. Support bus assembly to prevent twisting from eccentric loading.
- 5. 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. Sleeves for Future Cables: Install capped sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.
- J. Workspace: Install cable trays with enough space to permit access for installing cables.
- K. After installation of cable trays is completed, install warning signs in visible locations on or near cable trays.
- L. Cable Runway: Provide protective end caps on all exposed ends. Provide cable retaining posts on stingers edges. Provide radius drops where cables exit cable runway.

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:

SECTION 260536 – CABLE TRAYS FOR ELECTRICAL SYSTEMS

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. Repair damage to PVC or paint finishes with matching touchup coating recommended by cable tray manufacturer.
3. 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 SUMMARY

- A. This Section includes the following:
 - 1. Conduit, ducts, and duct accessories for direct-buried and concrete-encased duct banks.
 - 2. Handholes and pull boxes.
- B. Related sections include the following:
 - 1. Division 26 Section "Common Work Results for Electrical Systems"

1.2 DEFINITION

- A. RNC: Rigid nonmetallic conduit.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Duct-bank materials, including separators and miscellaneous components.
 - 2. Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
 - 3. Accessories for handholes and pull boxes.
 - 4. Warning tape.
 - 5. Handholes.
- B. Product Certificates: For concrete and steel used in precast concrete pull boxes and handholes, as required by ASTM C 858.
- C. Qualification Data: For professional engineer and testing agency.
- D. Source quality-control test reports.
- E. Field quality-control test reports.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Comply with ANSI C2.
- C. Comply with NFPA 70.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming. Nonmetallic conduit shall be protected from the direct rays of the sun.
- B. Store handholes at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.
- C. Lift and support handholes units only at designated lifting or supporting points.

SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

1.6 PROJECT CONDITIONS

- A. Interruption of Existing Electrical and Communication Service: Do not interrupt electrical or communication service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide any required temporary communication service according to requirements indicated:
 - 1. Notify Architect no fewer than seven days in advance of proposed interruption of communication service.
 - 2. Do not proceed with interruption of communication service without Architect's written permission.

1.7 COORDINATION

- A. Coordinate layout and installation of ducts, handholes, and pull boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.
- B. Coordinate elevations of ducts and duct-bank entrances into handholes with final locations and profiles of ducts and duct banks as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions and to ensure that duct runs drain to handholes, and as approved by Architect.

PART 2 - PRODUCTS

2.1 CONDUIT

- A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.
- B. RNC: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.2 NONMETALLIC DUCTS AND DUCT ACCESSORIES

- 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. Cantex, Inc.
 - 2. CertainTeed Corp.; Pipe & Plastics Group.
 - 3. IPEX Inc.
 - 4. Lamson & Sessions; Carlon Electrical Products.
 - 5. Or Approved Equal.
- B. Underground Plastic Utilities Duct: NEMA TC 6 & 8, Type DB-60-PVC, ASTM F 512, with matching fittings by the same manufacturer as the duct, complying with NEMA TC 9.
- C. Duct Accessories:
 - 1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum duct spacings indicated while supporting ducts during concreting or backfilling. Solid plane type spacers are not acceptable.
 - 2. Warning Tape:
 - a. Tape:

SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

- 1) Recommended by manufacturer for the method of installation and suitable to identify and locate underground utility lines.
- 2) Printing on tape shall be permanent and shall not be damaged by burial operations.
- 3) Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

b. Color and Printing:

- 1) Comply with ANSI Z535.1 through ANSI Z535.5.
- 2) Inscriptions for Tapes: COMMUNICATIONS CABLE for communications ducts and ELECTRIC for electric ducts.
- 3) Communications tape shall be orange and electric shall be red.

c. Tag:

- 1) Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, compounded for direct-burial service.
- 2) Overall Thickness: 5 mils.
- 3) Foil Core Thickness: 0.35 mil.
- 4) Weight: 28 lb/1000 sq. ft.
- 5) 3-Inch (75-mm) Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

2.3 HANDHOLES AND PULL BOXES OTHER THAN PRECAST CONCRETE

A. Description: Comply with SCTE 77.

1. Color: Gray.
2. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering,
 - a. "ELECTRIC."
 - b. Tier level number, indicating that the unit complies with the structural load test for that tier according to SCTE 77.
6. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, retained to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
7. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 inches wide by 24 inches long and larger shall have factory-installed inserts for cable racks and pulling-in irons.

B. Polymer Concrete Handholes and Pull Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two. Handholes and pull boxes shall comply with the requirements of SCTE 7 Tier 15 and Tier 22 loading.

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:

SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

- a. Armorcast Products Company.
- b. Carson Industries LLC.
- c. CDR Systems Corporation.
- d. Hubbell Power Systems; Lenoir City Division.
- e. NewBasis.
- f. Or Approved Equal.

2.4 SOURCE QUALITY CONTROL

- A. Test and inspect precast concrete utility structures according to ASTM C 1037.

PART 3 - EXECUTION

3.1 UNDERGROUND DUCT APPLICATION

- A. Underground Ducts for Electric: RNC, NEMA Type EPC-40-PVC in concrete-encased duct bank, unless otherwise indicated.

3.2 UNDERGROUND ENCLOSURE APPLICATION

- A. Handholes and Pull Boxes:
 - 1. Do not place unit in roadways or other deliberate traffic path.
 - 2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 or Tier 22 structural load rating.
 - 3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer concrete units, SCTE 77, Tier 15 or Tier 22 structural load rating.
 - 4. Units Subject to Light-Duty Pedestrian Traffic Only: Polymer concrete units, SCTE 77, Tier 15 or Tier 22 structural load rating.

3.3 EARTHWORK

- A. Excavation and Backfill: Comply with Division 02 "Sitework".
- B. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.
- D. Cut and patch existing pavement in the path of underground ducts and utility structures.

3.4 DUCT INSTALLATION

- A. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends minimum of 48 inches, both horizontally and vertically, at other locations, unless otherwise indicated.
- B. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.
- C. Duct Entrances to Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch ducts, and vary proportionately for other duct sizes.

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1. Begin change from regular spacing to end-bell spacing 10 feet (3 m) from the end bell without reducing duct line slope and without forming a trap in the line.
 2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to handhole.
 3. Grout end bells into structure walls from both sides to provide watertight entrances.
- D. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing polyethylene plugs to withstand at least 15-psig hydrostatic pressure.
- E. Pulling Cord: Install 100-lbf-test nylon cord in all ducts provided, including spares.
- F. Concrete-Encased Ducts: Support ducts on duct separators.
1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than 4 spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers. Tie entire assembly together using fabric straps.
 2. Concreting Sequence: Pour each run of envelope between terminations in one continuous operation.
 - a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations or use other specific measures to prevent expansion-contraction damage.
 - b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing rod dowels extending 18 inches into concrete on both sides of joint near corners of envelope.
 3. Pouring Concrete: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Use a plank to direct concrete down sides of bank assembly to trench bottom. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Power driven agitating equipment specifically designed for duct bank applications shall be used.
 4. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
 5. Minimum Space between Ducts: 3 inches between ducts and exterior envelope wall, 1.5 inches between ducts for like services.
 6. Depth: Install top of duct bank at least 24 inches below grade, unless otherwise indicated.
 7. Provide pulling eyes opposite each duct entry.
 8. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of the centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

3.5 INSTALLATION OF HANDHOLES AND PULL BOXES

- A. Install handholes and pull boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use pull box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.
- B. Unless otherwise indicated, support units on a level 6-inch-thick bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

- C. Elevation: Set so cover surface will be flush with finished grade.
- D. Install handholes and pull boxes with bottom below the frost line, below grade.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Retain arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.
- F. Field-cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
- G. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.
 - 1. Concrete: 3000 psi, 28-day strength, complying with Division 03 Section "Cast-in-Place Concrete", with a troweled finish.
 - 2. Dimensions: 10 inches wide by 12 inches deep.

3.6 GROUNDING

- A. Comply with IEEE C2 grounding requirements.

3.7 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
 - 1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts.
 - 2. At the completion of construction of ductbank, pull an aluminum or wood mandrel and brush or pig through all conduits in the presence of Owner's Representative to verify accessibility and cleanliness of conduit systems. If obstructions are indicated, remove obstructions and retest. Mandrel shall be equal to 80 percent fill of duct.
 - 3. Test grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance.
- B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.8 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification for conductors and communication and control cables.
 - 3. Underground-line warning tape.
 - 4. Warning labels and signs including arc flash labeling.
 - 5. Instruction signs.
 - 6. Equipment identification labels.
 - 7. Miscellaneous identification products.
- B. Related Sections include the following:
 - 1. Division 01 Section "Construction Waste Management"

1.2 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.3 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.

1.4 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. Metal-Backed, Butyrate Warning Signs:
 - 1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
 - 2. 1/4-inch grommets in corners for mounting.
 - 3. Nominal size, 10 by 14 inches.
- E. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES".
 - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES".

2.3 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
 - 1. Engraved legend with black letters on white face.
 - 2. Punched or drilled for mechanical fasteners.
 - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
- B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

2.4 EQUIPMENT IDENTIFICATION LABELS

- A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed.

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

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 (other than automatic transfer switches) 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.

2.5 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws, or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 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.

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- G. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.
- H. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

3.2 IDENTIFICATION SCHEDULE

- A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in 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 service, feeder, and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - c. 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. Power-Circuit Conductor Identification, more than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use stamped brass metal tags. Secure with self locking cabling tie fastener.
- C. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- D. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- E. 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.

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

- F. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
 - 1. Install underground-line warning tape for cables in raceway.
- G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
 - 1. Comply with 29 CFR 1910.145.
 - 2. Identify system voltage with black letters on an orange background.
 - 3. Apply to exterior of door, cover, or other access.
 - 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
- H. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- I. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
 - 1. Labeling Instructions:
 - a. 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. Enclosures and electrical cabinets.
 - c. Access doors and panels for concealed electrical items.
 - d. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
 - e. Enclosed switches.
 - f. Enclosed controllers.
 - g. Push-button stations.
 - h. Contactors.
 - i. Remote-controlled switches and control devices.
 - j. Monitoring and control equipment.

END OF SECTION

SECTION 260800 - ELECTRICAL SYSTEMS VERIFICATION

PART 1 - GENERAL

1.1 COMMISSIONING AGENCY

- A. System Verification involves all parties to the design and construction process, including the electrical (Division 26) contractor, as many HVAC system components require electrical power and controls in order to operate as specified.

1.2 CONTRACTOR RESPONSIBILITY

- A. The electrical contractor is responsible for assuring that systems verifications for electrical systems as it applies to Division 21, 22, 23 and 26 specifications, individually and collectively.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Photoelectric switches.
2. Standalone daylight-harvesting switching and dimming controls.
3. Indoor occupancy and vacancy sensors.
4. Switchbox-mounted occupancy sensors.
5. Digital timer light switches.
6. High-bay occupancy sensors.
7. Extreme temperature occupancy sensors.
8. Outdoor motion sensors.
9. Lighting contactors.
10. Emergency shunt relays.

B. Related Requirements:

1. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Show installation details for the following:
 - a. Occupancy sensors.
 - b. Vacancy sensors.
2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Installation Drawings: Lighting 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. Location of devices.
2. Wiring requirements.

B. Field quality-control reports.

C. Sample Warranty: For manufacturer's warranties.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.

SECTION 260923 - LIGHTING CONTROL DEVICES

2. Program Software Backup: On USB media. Provide names, versions, and website addresses for locations of installed software.
3. Device address list.
4. Printout of software application and graphic screens.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of lighting control software.
 - b. Faulty operation of lighting control devices.
 2. Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LIGHTING CONTROL

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Acuity Controls, nLight and sensor switch lighting controls or comparable product by one of the following:
 1. Wattstopper.
 2. Lutron.
 3. Or approved equal.

2.3 POWER PACK RELAYS

- A. Power Pack: Dry contacts rated for 20-A LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 1. LED status lights to indicate load status.
 2. Plenum rated.
- B. Power Pack: Digital controller capable of accepting 2 RJ45 inputs with one or two outputs rated for 20-A incandescent or LED load at 120- and 277-V ac, for 16-A LED at 120- and 277-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc Class 2 power source, as defined by NFPA 70.
 1. With integral current monitoring
 - a. Compatible with digital addressable lighting interface.
 - 1) Plenum rated.

2.4 INDOOR OCCUPANCY AND VACANCY SENSORS

- A. General Requirements for Sensors:
 1. Ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
 2. Passive infrared or dual technology type with passive infrared and either ultrasonic or microphonic as indicated.
 3. Separate power pack.
 4. Hardwired connection to switch.

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5. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 6. Operation:
 - a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - c. Combination Sensor: Unless otherwise indicated, sensor shall be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 7. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
 8. Power: Line voltage or low voltage, as indicated.
 9. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 10. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 11. Bypass Switch: Override the "on" function in case of sensor failure.
- B. PIR Type: Wall or Ceiling mounted, as indicated; detect occupants in coverage area by their heat and movement.
1. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm).
 2. Detection Coverage (Room, Ceiling Mounted): Detect occupancy anywhere in a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
 3. Detection Coverage (Corridor, Ceiling Mounted): Detect occupancy within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling.
 4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet (110 square meters) when mounted 48 inches (1200 mm) above finished floor.
- C. Ultrasonic Type: Wall or Ceiling mounted, as indicated; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.
1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
 2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. (56 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
 4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. (186 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
 5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling in a corridor not wider than 14 feet (4.3 m).

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6. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet (110 square meters) when mounted 84 inches (2100 mm) above finished floor.
- D. Dual-Technology Type: Wall or Ceiling mounted, as indicated; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
 1. Sensitivity Adjustment: Separate for each sensing technology.
 2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm) and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
 4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet (110 square meters) when mounted 48 inches (1200 mm) above finished floor.

2.5 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox, using hardwired connection.
 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
 4. Switch Rating: Not less than 800-VA LED load at 120 V, 1200-VA LED load at 277 V, and 800-W incandescent.
- B. Wall-Switch Sensor:
 1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft. (84 sq. m).
 2. Sensing Technology: PIR Dual technology - PIR and ultrasonic, as indicated.
 3. Switch Type: SP, field-selectable automatic "on," or manual "on," automatic "off."
 4. Capable of controlling load in three-way application.
 5. Voltage: Match the circuit voltage.
 6. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
 7. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
 8. Concealed, "off" time-delay selector at 30 seconds and 5, 10, and 20 minutes.
 9. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
 10. Color: Match wiring devices in Section 26 27 26.
 11. Faceplate: Match type and finish as indicated in Section 26 27 26.

2.6 LIGHTING CONTACTORS

- A. Manufacturers: Subject to compliance with requirements, provide product from one of the following manufacturers:

SECTION 260923 - LIGHTING CONTROL DEVICES

1. Square D.
2. Eaton.
3. Siemens.
4. General Electric.
5. Or approved equal.

- B. Description: Electrically operated and electrically held, combination-type lighting contactors with nonfused disconnect, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less THD of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

2.7 EMERGENCY SHUNT RELAY

- A. Description: NC, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924.

1. Coil Rating: Match circuit voltage.

2.8 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SENSOR INSTALLATION

- A. Comply with NECA 1.

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- B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- C. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.3 CONTACTOR INSTALLATION

- A. Comply with NECA 1.
- B. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.4 WIRING INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).
- C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.5 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
 - 1. Identify controlled circuits in lighting contactors.
 - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Lighting control devices will be considered defective if they do not pass tests and inspections.

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- D. Prepare test and inspection reports.

3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
 - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
 - 2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
 - 3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.8 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.
- B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
 - 1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.9 DEMONSTRATION

- A. Coordinate demonstration of products specified in this Section with demonstration requirements for low-voltage, programmable lighting control systems specified in Section 260943.23 "Relay-Based Lighting Controls."
- B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.
- B. Related sections include the following:
 - 1. Division 01 Section "Demonstration and Training".
 - 2. Division 01 Section "Construction Waste Management".
 - 3. Division 26 Sections:
 - a. "Common Work Results for Electrical"
 - b. "Low Voltage Electrical Power Conductors and Cables".
 - c. "Grounding and Bonding for Electrical Systems"
 - d. "Identification for Electrical Systems".

1.2 DEFINITIONS

- A. SVR: Suppressed voltage rating.

1.3 SUBMITTALS

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 6. Include wiring diagrams for power, signal, and control wiring.
 - 7. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
- C. Qualification Data: For qualified testing agency.
- D. 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.
- E. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

SECTION 262416 - PANELBOARDS

- F. Operation and Maintenance Data: For panelboards and components 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 overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NEMA PB 1.
- E. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Handle and prepare panelboards for installation according to NEMA PB 1.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations:
1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.8 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. Keys: Two spares for each type of panelboard cabinet lock.

PART 2 - PRODUCTS**2.1 GENERAL REQUIREMENTS FOR PANELBOARDS**

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems".
- B. Enclosures: Flush- or surface-mounted cabinets as indicated.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 - 4. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Galvanized steel.
 - 5. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.
- C. Incoming Mains Location: Contractor shall be responsible for coordinating feed location.
- D. Phase, Neutral and Ground Buses:
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
 - 3. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
- E. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Main and Neutral Lugs: Mechanical type.
 - 2. Ground Lugs and Bus-Configured Terminators: Mechanical type.
 - 3. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 - 4. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals as determined by fault current study. The minimum interrupting ratings for circuit breakers shall be 10,000 RMS symmetrical amperes for 208Y/120 volt panelboards and 14,000 RMS symmetrical amperes for 480Y/277 volt panelboards. Series rated panelboards are not acceptable.
- H. Protective device selection shall be based on the results of the coordination study.

SECTION 262416 - PANELBOARDS

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Square D; a brand of Schneider Electric (NQ or NF) or comparable product by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Or approved equal.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker or lugs only as indicated.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Door-in-door feature with continuous hinges; secured with flush latch with tumbler lock; keyed alike.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following, or an approved equal:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
 - 5. Or approved equal.
- B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Electronic Trip Circuit Breakers: Microprocessor based trip system with true rms sensing, field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t response, (where indicated on drawings).
 - 3. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
 - 4. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
 - 5. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - c. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

SECTION 262416 - PANELBOARDS

- d. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
- e. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
- f. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
- g. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle and store panelboards according to of NECA 407 and NEMA PB 1.1.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install panelboards and accessories according to NECA 407 and NEMA PB 1.1.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- C. Lighting and Appliance Panels: 72 inches above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- E. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.
- G. Recessed Panels: Stub four ¾ inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.
- H. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- I. Comply with NECA 1.
- J. Circuit breakers rated below 200 amps may be electronic trip type or thermal magnetic type circuit breakers. Electronic trip type may be provided to allow greater selective coordination. Circuit breakers rated above 200 amps shall be electronic trip type. Circuit breakers rated above 1200 amp shall be 100% rated. Circuit breakers rated 1000 amps or more and connected to the 480Y/277 volt system shall have integral ground fault pick-up, time delay, and I²t response.

SECTION 262416 - PANELBOARDS

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems".
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems".
- D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems".

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable component to function smoothly and lubricate as recommended by manufacturer.
- B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
 - 1. Measure as directed during period of normal system loading.
 - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
 - 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
 - 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Twist-locking receptacles.
 - 3. Snap switches.
- B. Related Sections include the following:
 - 1. Division 01 Section "Construction Waste Management"

1.2 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.
- D. Field quality-control test reports.
- E. 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.

1.4 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: Subject to compliance with requirements, provide products by one of the following, or an approved equal. (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).
 5. Or approved equal.

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. Products: Subject to compliance with requirements, provide one of the following, or an approved equal:
 - 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).
 - e. Or approved equal.
- B. Convenience Receptacles, 125 V, 20 A with 12v dc, duplex 2.0A USB type A ports: 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. Products: Subject to compliance with requirements, provide one of the following, or an approved equal:
 - a. Cooper; TR7756 (duplex).
 - b. Hubbell; USB20A (duplex).
 - c. Leviton; M58AA (duplex).
 - d. Or approved equal.

2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following, or an approved equal:
 - a. Cooper; XGF20.
 - b. Hubbell; GF5362
 - c. Leviton; 7599
 - d. Pass & Seymour; 2094.
 - e. Or approved equal.

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C. Duplex GFCI Tamper Resistant Convenient Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following, or an approved equal:
 - a. Cooper; TRSGF20.
 - b. Hubbell; GF5362SG
 - c. Leviton; G5362-TI
 - d. Pass & Seymour; 2097TR.
 - e. Or approved equal.

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. Products: Subject to compliance with requirements, provide one of the following, or an approved equal:
 - a. Cooper 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
 - b. Hubbell HBL 1221 (single pole), HBL 1222 (two pole), HBL 1223 (three way), HBL 1224 (four way).
 - c. Leviton: 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
 - d. Pass & Seymour: PS20AC1 (single pole), PS20AC2 (two pole), PS20AC3 (three way), PS20AC4 (four way).
 - e. Or approved equal.

2.5 WALLBOX DIMMERS (LINE VOLTAGE)

- A. Dimmers shall be specifically listed for the load controlled.
- B. Dimmers shall contain an air-gap switch, which shall be accessible without removing the faceplate.
- C. Dimmers shall return lighting to level set prior to interruption of power upon restoration of power.
- D. Dimmers shall be linear slide type. Dimmers shall provide a smooth and continuous square law dimming curve.
- E. Dimmers shall include voltage compensation circuitry that adjusts the firing angle of the dimmer in such a manner as to compensate for variations in the AC line voltage.
- F. Heat fins shall not be visible on the front of the dimmer.
- G. Wallbox dimmers shall be Lutron "Nova" series or approved equal.

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.

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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.
- C. Security Type Cover Plates: 11 ga. steel with countersink captive torx head screws. Plates shall be Kenall Mighty Mac or approved equal.

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: Ivory, unless otherwise indicated or required by NFPA 70 or device listing.

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 ensure 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.

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7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
10. Receptacles located within 6 feet of a water source shall be GFCI type.
11. Receptacles located within detention areas shall be GFCI, Tamper Resistant type.
12. Receptacles located above counters shall include integral duplex USB ports.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles as directed by the Architect, 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.

1. Provide security type device plates for devices located in detention areas.

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 SUMMARY****A. Section Includes:**

1. Cartridge fuses rated 600-V ac and less for use in control circuits, enclosed switches, enclosed controllers, and motor-control centers.
2. Plug fuses rated 125-V ac and less for use in plug-fuse-type enclosed switches.
3. Plug-fuse adapters for use in Edison-base, plug-fuse sockets.
4. Spare-fuse cabinets.

B. Related Sections include the following:

1. Division 01 Section "Construction Waste Management".
2. Division 26 Sections:
 - a. "Enclosed Switches and Circuit Breakers".
 - b. "Enclosed Controllers".

1.2 SUBMITTALS**A. Product Data:** For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
 - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
 - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
3. Current-limitation curves for fuses with current-limiting characteristics.
4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
5. Coordination charts and tables and related data.
6. Fuse sizes for elevator feeders and elevator disconnect switches.

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.

1.3 QUALITY ASSURANCE**A. Source Limitations:** Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

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- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Comply with UL 248-11 for plug fuses.

1.4 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.

1.5 COORDINATION

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

1.6 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, provide products by one of the following:
 - 1. Cooper Bussmann, Inc.
 - 2. Edison Fuse, Inc.
 - 3. Mersen.
 - 4. Littelfuse, Inc.
 - 5. Or approved equal.

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 not defined above.
 - 2. Small dimension fuses shall be installed as the protective device in all motor control circuits.

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 and adjacent to each fuse block, socket, and holder.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Circuit Breakers
 - 4. Enclosures.
- B. Related sections include the following:
 - 1. Division 01 Section "Construction Waste Management".
 - 2. Division 26 Sections:
 - a. "Common Work Results for Electrical"
 - b. "Low Voltage Electrical Power Conductors and Cables".
 - c. "Grounding and Bonding for Electrical Systems"
 - d. "Hangers and Supports for Electrical Systems".
 - e. "Identification for Electrical Systems".
 - f. "Enclosed Controllers".

1.2 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.3 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Include evidence of NRTL listing for series rating of installed devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 - 6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.
- C. Qualification Data: For qualified testing agency.
- D. Field quality-control reports.
 - 1. Test procedures used.

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2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Manufacturer's field service report.

F. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current 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. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NFPA 70.

1.5 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.

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.

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

2. Fuse Pullers: Two for each size and type.

PART 2 PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following, or an approved equal:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.
 5. Or approved equal.
- 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. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
 5. Hookstick Handle: Allows use of a hookstick to operate the handle.
 6. Lugs: Compression type, suitable for number, size, and conductor material.
 7. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following, or an approved equal:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.
 5. Or approved equal.
- B. Type HD, Heavy Duty, Single Throw, 240 and 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- 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. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
 4. Hookstick Handle: Allows use of a hookstick to operate the handle.

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

5. Lugs: Compression type, suitable for number, size, and conductor material.

2.3 CIRCUIT BREAKERS

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following, or an approved equal:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.
 5. Or approved equal.
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
 3. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
 4. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - c. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - d. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
 - e. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
 - f. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
 - g. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

2.4 ENCLOSURES

- A. Enclosed Switches and circuit breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 2. Outdoor Locations: NEMA 250, Type 3R.
 3. Washdown Locations: NEMA 250, Type 4X Stainless Steel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Switches and Circuit Breakers Installed Between Variable Speed Controllers and Load: Provide auxiliary contacts.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices and leave in the "off" position after final installation and testing.
- E. 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.
- F. 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. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

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 SUMMARY

A. Section includes the following enclosed controllers rated 600 V and less:

1. Full-voltage manual.
2. Full-voltage magnetic.

B. Related sections include the following:

1. Division 01 Section "Demonstration and Training".
2. Division 01 Section "Construction Waste Management".
3. Division 26 Sections:
 - a. "Common Work Results for Electrical"
 - b. "Low Voltage Electrical Power Conductors and Cables".
 - c. "Grounding and Bonding for Electrical Systems"
 - d. "Hangers and Supports for Electrical Systems".
 - e. "Identification for Electrical Systems".
 - f. "Fuses".

1.2 DEFINITIONS

- A. CPT: Control power transformer.
- B. MCCB: Molded-case circuit breaker.
- C. MCP: Motor circuit protector.
- D. N.C.: Normally closed.
- E. N.O.: Normally open.
- F. OCPD: Overcurrent protective device.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed controllers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event".

1.4 SUBMITTALS

- A. Product Data: For each type of enclosed controller. Include manufacturer's technical data on features, performance, electrical characteristics, ratings, and enclosure types and finishes.
- B. Shop Drawings: For each enclosed controller. Include dimensioned plans, elevations, sections, details, and required clearances and service spaces around controller enclosures.
1. Show tabulations of the following:
 - a. Each installed unit's type and details.
 - b. Factory-installed devices.

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- c. Nameplate legends.
 - d. Short-circuit current rating of integrated unit.
 - e. Listed and labeled for integrated short-circuit current (withstand) rating of OCPDs in combination controllers by an NRTL acceptable to authorities having jurisdiction.
 - f. Features, characteristics, ratings, and factory settings of individual OCPDs in combination controllers.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
 - C. Qualification Data: For qualified testing agency.
 - D. Field quality-control reports.
 - E. Operation and Maintenance Data: For enclosed controllers 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. Routine maintenance requirements for enclosed controllers and installed components.
 - 2. Manufacturer's written instructions for setting field-adjustable overload relays.
 - F. Load-Current and Overload-Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.
- 1.5 QUALITY ASSURANCE
- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
 - B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - C. Comply with NFPA 70.
 - D. IEEE Compliance: Fabricate and test enclosed controllers according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems".
- 1.6 DELIVERY, STORAGE AND HANDLING
- A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.
 - B. If stored in areas subject to weather, cover enclosed controllers to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers.
- 1.7 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.

1.8 COORDINATION

- A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

1.9 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 for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 - 2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
 - 3. Indicating Lights: Two of each type and color installed.
 - 4. Auxiliary Contacts: Furnish one spare(s) for each size and type of magnetic controller installed.
 - 5. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

PART 2 PRODUCTS**2.1 FULL-VOLTAGE CONTROLLERS**

- A. General Requirements for Full-Voltage Controllers: Comply with NEMA ICS 2, general purpose, Class A.
- B. Motor-Starting Switches: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off or on.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or an approved equal:
 - a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - c. Siemens Energy & Automation, Inc.
 - d. Square D; a brand of Schneider Electric.
 - e. Or approved equal.
 - 2. Configuration: Nonreversing.
 - 3. Flush or surface mounting as indicated.
 - 4. Green pilot light.
- C. Fractional Horsepower Manual Controllers: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or an approved equal:
 - a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - c. Siemens Energy & Automation, Inc.
 - d. Square D; a brand of Schneider Electric.
 - e. Or approved equal.

SECTION 262913 - ENCLOSED CONTROLLERS FOR ELECTRICAL

2. Configuration: Nonreversing.
 3. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 20 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button; bimetallic type.
 4. Flush or surface mounting as indicated.
 5. Green run pilot light.
 6. Controller shall be inoperative if overload element is removed.
- D. Magnetic Controllers: Full voltage, across the line, electrically held.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or an approved equal:
 - a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - c. Siemens Energy & Automation, Inc.
 - d. Square D; a brand of Schneider Electric.
 - e. Or approved equal.
 2. Configuration: Nonreversing.
 3. Contactor Coils: Pressure-encapsulated type. Coils shall be replaceable from the front without removing starter from the panel.
 - a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.
 4. Power Contacts: Totally enclosed, double-break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
 5. Control Circuits: 120-V ac; obtained from integral CPT, with primary and secondary fuses of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.
 - a. CPT Spare Capacity: 50 VA.
 6. Bimetallic Overload Relays:
 - a. Inverse-time-current characteristic.
 - b. Class 20 tripping characteristic.
 - c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
 - d. Ambient compensated.
 - e. Automatic resetting.
 7. NC/NO, isolated overload alarm contact.
 8. External overload reset push button.
 9. Flush or surface mounted as indicated.
 10. Red or green pilot light as indicated.
- E. Combination Magnetic Controller: Factory-assembled combination of magnetic controller, OCPD, and disconnecting means.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or an approved equal:
 - a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - c. Siemens Energy & Automation, Inc.
 - d. Square D; a brand of Schneider Electric.

- e. Or approved equal.
- 2. Fusible Disconnecting Means:
 - a. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate Class R fuses.
 - b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
 - c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.
- 3. Nonfusible Disconnecting Means:
 - a. NEMA KS 1, heavy-duty, horsepower-rated, nonfusible switch.
 - b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
 - c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

2.2 ENCLOSURES

- A. Enclosed Controllers: NEMA ICS 6, to comply with environmental conditions at installed location.
 - 1. Dry and Clean Indoor Locations: Type 1.
 - 2. Outdoor Locations: Type 3R.
 - 3. Wash-Down Areas: Type 4X Stainless Steel.
 - 4. Food Production and Packaging Locations: NEMA 4X Stainless Steel.

2.3 ACCESSORIES

- A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.
 - 1. Push Buttons, Pilot Lights, and Selector Switches: Heavy-duty, oiltight type.
 - a. Push Buttons: Recessed, Shrouded types; momentary as indicated.
 - b. Pilot Lights: LED types; colors as indicated; push to test.
 - c. Selector Switches: Rotary type.
- B. Reversible N.C./N.O. auxiliary contact(s).
- C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.
- D. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.
- E. Sun shields installed on fronts, sides, and tops of enclosures installed outdoors and subject to direct and extended sun exposure.
- F. Cover gaskets for Type 1 enclosures.
- G. Terminals for connecting power factor correction capacitors to the load side of overload relays.
- H. Spare control wiring terminal blocks, quantity as indicated; wired.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas and surfaces to receive enclosed controllers, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine enclosed controllers before installation. Reject enclosed controllers that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Wall-Mounted Controllers: Install enclosed controllers on walls with tops at uniform height unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Division 26 Section "Hangers and Supports for Electrical Systems".
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install fuses in each fusible-switch enclosed controller.
- D. Install fuses in control circuits if not factory installed. Comply with requirements in Division 26 Section "Fuses".
- E. Install heaters in thermal overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.
- F. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.
- G. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Identify enclosed controllers, components, and control wiring. Comply with requirements for identification specified 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 nameplate.
 - 3. Label each enclosure-mounted control and pilot device.

3.4 CONTROL WIRING INSTALLATION

- A. Install wiring between enclosed controllers and remote devices and facility's central control system.
- B. Bundle, train, and support wiring in enclosures.
- C. Connect selector switches and other automatic-control selection devices where applicable.
 - 1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switch is in manual-control position.

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2. Connect selector switches with enclosed-controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.
 2. Test continuity of each circuit.
- C. Tests and Inspections:
 1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
 2. Test insulation resistance for each enclosed-controller element, component, connecting motor supply, feeder, and control circuits.
 3. Test continuity of each circuit.
 4. Verify that voltages at controller locations are within plus or minus 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Architect before starting the motor(s).
 5. Test each motor for proper phase rotation.
 6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Enclosed controllers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

- A. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

3.7 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until enclosed controllers are ready to be energized and placed into service.
- B. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following types of LED luminaires:
 - 1. LED Luminaires.
 - 2. Materials.
 - 3. Finishes.
 - 4. Luminaire support.

1.2 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.

1.3 ACTION 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.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
 - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.5 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.

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1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.7 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 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 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, or approved equal.

2.3 MATERIALS

- A. Metal Parts:
 - 1. Free of burrs and sharp corners and edges.
 - 2. Sheet metal components shall be steel unless otherwise indicated.
 - 3. Form and support to prevent warping and sagging.
- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

SECTION 265119 - LED LIGHTING

- C. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

2.4 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece.

2.5 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. 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:

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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.
- C. Prepare test and inspection reports.

END OF SECTION

SECTION 265219 - EXIT LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exit signs.
 - 2. Luminaire supports.

1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Lumen: Measured output of lamp and luminaire, or both.
- D. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of emergency lighting unit and exit sign.
 - 1. Include data on features, accessories, and finishes.
 - 2. Include physical description of the unit and dimensions.
 - 3. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.
 - 4. Include photometric data and adjustment factors based on laboratory tests for each luminaire type.
 - 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.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Comply with NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.7 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

SECTION 265219 - EXIT LIGHTING

1. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Fabricate and label exit signs to comply with UL 924.
- C. Comply with NFPA 70 and NFPA 101.

2.2 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, or approved equal.

2.3 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 or 277 V ac as indicated.
 2. Lamps for AC Operation: LEDs; 50,000 hours minimum rated lamp life.

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:
 1. Smooth operating, free of light leakage under operating conditions.
 2. Designed to permit relamping without use of tools.
 3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

2.5 METAL FINISHES

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable.

2.6 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of luminaires.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
- C. Examine walls and ceilings for suitable conditions where exit signs units will be installed.
- D. 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. Provide support for luminaire without causing deflection of ceiling.
 - 3. 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. 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 walls.
 - 2. Do not attach luminaries directly to gypsum board.

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. 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. "Identification for Electrical Systems".
 - d. "Cable Trays for Electrical Systems".
 - 2. Division 27 Sections:
 - a. "Communications Horizontal Cabling" for voice and data cabling associated with system panels and devices.

1.3 DEFINITIONS

- A. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.
- B. BICSI: Building Industry Consulting Service International.
- C. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).
- D. LAN: Local area network.
- E. 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. 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.

SECTION 271100 – COMMUNICATIONS EQUIPMENT ROOM FITTINGS

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 and cable trays 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: Refer to section "Cable Trays for Electrical Systems" for cable trays.

SECTION 271100 – COMMUNICATIONS EQUIPMENT ROOM FITTINGS

- 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. Basis of Design: Subject to compliance with requirements, provide Great Lakes GL24WM Series swing out wall rack or comparable product by the following:

1. Hubbell Premise Wiring.
2. Eaton Cooper B-Line.
3. Panduit Corp.
4. Middle Atlantic

- B. General Frame Requirements:

1. Distribution Frames: Wall mounted, 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 black finish, baked-polyester powder coat.

- C. Modular Wall Cabinets:

1. Wall mounting.
2. Steel construction.
3. Treated to resist corrosion.
4. Lockable front and rear doors.
5. Louvered side panels.
6. Cable access provision top and bottom.
7. Grounding lug.
8. Roof mounted fan.
9. Power strip.

- 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.

SECTION 271100 – COMMUNICATIONS EQUIPMENT ROOM FITTINGS

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 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.

2.6 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 ENTRANCE FACILITIES

- A. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and a housing when so directed by service provider.
- B. Install underground pathways complying with recommendations in TIA/EIA-569-A, "Entrance Facilities" Article.

3.2 Install underground entrance pathway complying with Division 26 Section "Raceway and Boxes for Electrical Systems".

- A. Comply with NECA 1.
- B. Comply with BICSI TDMM for layout and installation of communications equipment rooms.
- C. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.
- D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.3 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.

SECTION 271100 – COMMUNICATIONS EQUIPMENT ROOM FITTINGS

3.4 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.

3.5 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." Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- 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.
 - 2. UTP cabling.
 - 3. Cable connecting hardware, patch panels, and cross-connects.
 - 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. "Identification for Electrical Systems".

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. Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).
- G. LAN: Local area network.
- H. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.
- I. RCDD: Registered Communications Distribution Designer.
- J. 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

SECTION 271500 – COMMUNICATIONS HORIZONTAL CABLING

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 than 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.
4. Splitters shall not be installed as part of the optical fiber 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 for Category 6, when tested according to test procedures of this standard.

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 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.

C. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

D. Source quality-control reports.

E. Field quality-control reports.

F. 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.

SECTION 271500 – COMMUNICATIONS HORIZONTAL CABLING

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.
- 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 temporary 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. 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. 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 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.
 - 6. SYSTIMAX Solutions; a CommScope, Inc. brand.
- B. Description: 100-ohm, 4-pair UTP, covered with a thermoplastic jacket.
 - 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.
- C. Color: Voice cables shall have white outer jacket. Data cables shall have blue outer jacket.

SECTION 271500 – COMMUNICATIONS HORIZONTAL CABLING

2.4 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hubbell Premise Wiring.
 - 2. Leviton Voice & Data Division.
 - 3. Panduit Corp.
 - 4. Siemon Co. (The).
 - 5. SYSTIMAX Solutions; a CommScope, Inc. brand.
 - 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. Cables shall be terminated with connecting hardware of same category or higher.
- C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
 - 1. Number of Terminals per Field: One for each conductor in assigned cables.
- E. 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.
- F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
- G. Patch Cords: Factory-made, four-pair cables; terminated with eight-position modular plug at each end.
 - 1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
 - 2. Patch cords shall have color-coded boots for circuit identification.
 - 3. Provide patch cables for each cable terminated on patch panels. Patch cables lengths shall be distributed as follows: 4 foot (50% of total); 7 foot (40% of total); and 10 (10% of total).

2.5 TELECOMMUNICATIONS OUTLET/CONNECTORS

- A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1, Category 6.
- B. Workstation Outlets: Four-port-connector assemblies mounted in single faceplate.
 - 1. Faceplate: Match type and finish as indicated in Division 26 Section "Wiring Devices".
 - 2. For use with snap-in jacks accommodating any combination of UTP cords.
 - a. Flush mounting jacks, positioning the cord at a 45-degree angle.
 - 3. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

SECTION 271500 – COMMUNICATIONS HORIZONTAL CABLING

4. Voice jacks shall be white color and data jacks shall be blue color.

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 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, j-hooks, and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, 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.

SECTION 271500 – COMMUNICATIONS HORIZONTAL CABLING

3.3 INSTALLATION OF PATHWAYS

- A. 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.
- B. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- C. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- D. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- E. 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.
- F. 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. MUTOA shall not be used as a cross-connect point.
 - 5. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:
 - a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
 - b. Locate consolidation points for UTP at least 49 feet from communications equipment room.
 - 6. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 7. 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.
 - 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.

SECTION 271500 – COMMUNICATIONS HORIZONTAL CABLING

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.
- 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.
- 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 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.
- 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.

SECTION 271500 – COMMUNICATIONS HORIZONTAL CABLING

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. 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".
 - 1. Administration Class: 1.
 - 2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.
- B. Using cable management system software specified in Part 2, develop Cabling Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable and label cable, jacks, connectors, and terminals to which it connects with same designation. At completion, cable and asset management software shall reflect as-built conditions. Identification for each component shall comply with the Owner's telecommunication standards.
- C. Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- D. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration, including optional identification requirements of this standard.
- E. Cable Schedule: Post in 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.
- F. 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.

G. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
 - a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
 - b. Label each unit and field within distribution racks and frames.
4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

H. Labels 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.

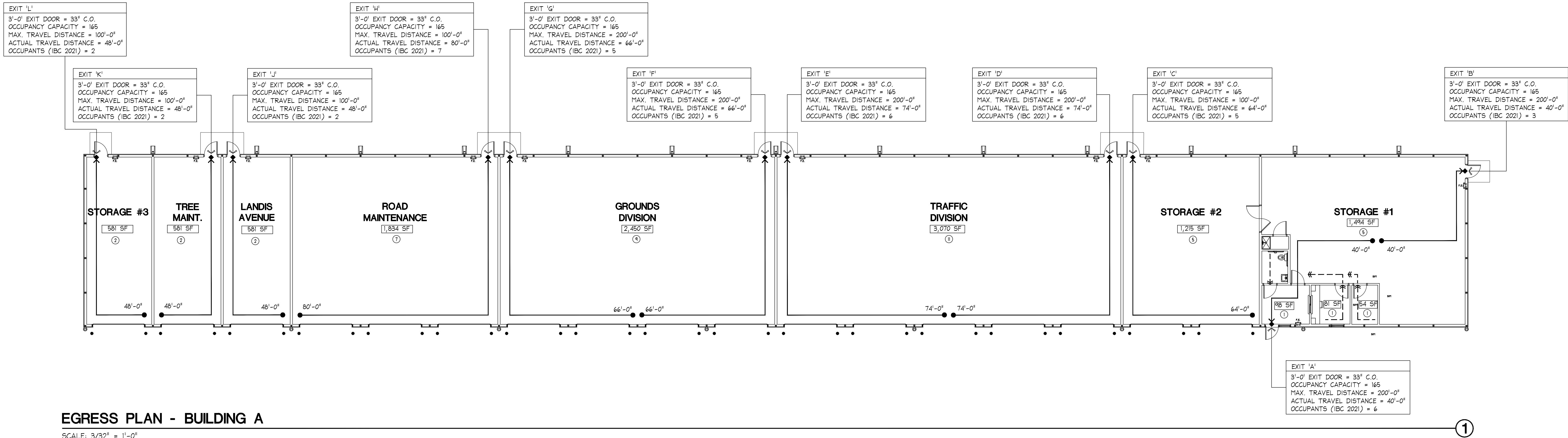
3.8 FIELD QUALITY CONTROL**A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.****B. Perform tests and inspections.****C. Tests and Inspections:**

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. 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.

SECTION 271500 – COMMUNICATIONS HORIZONTAL CABLING

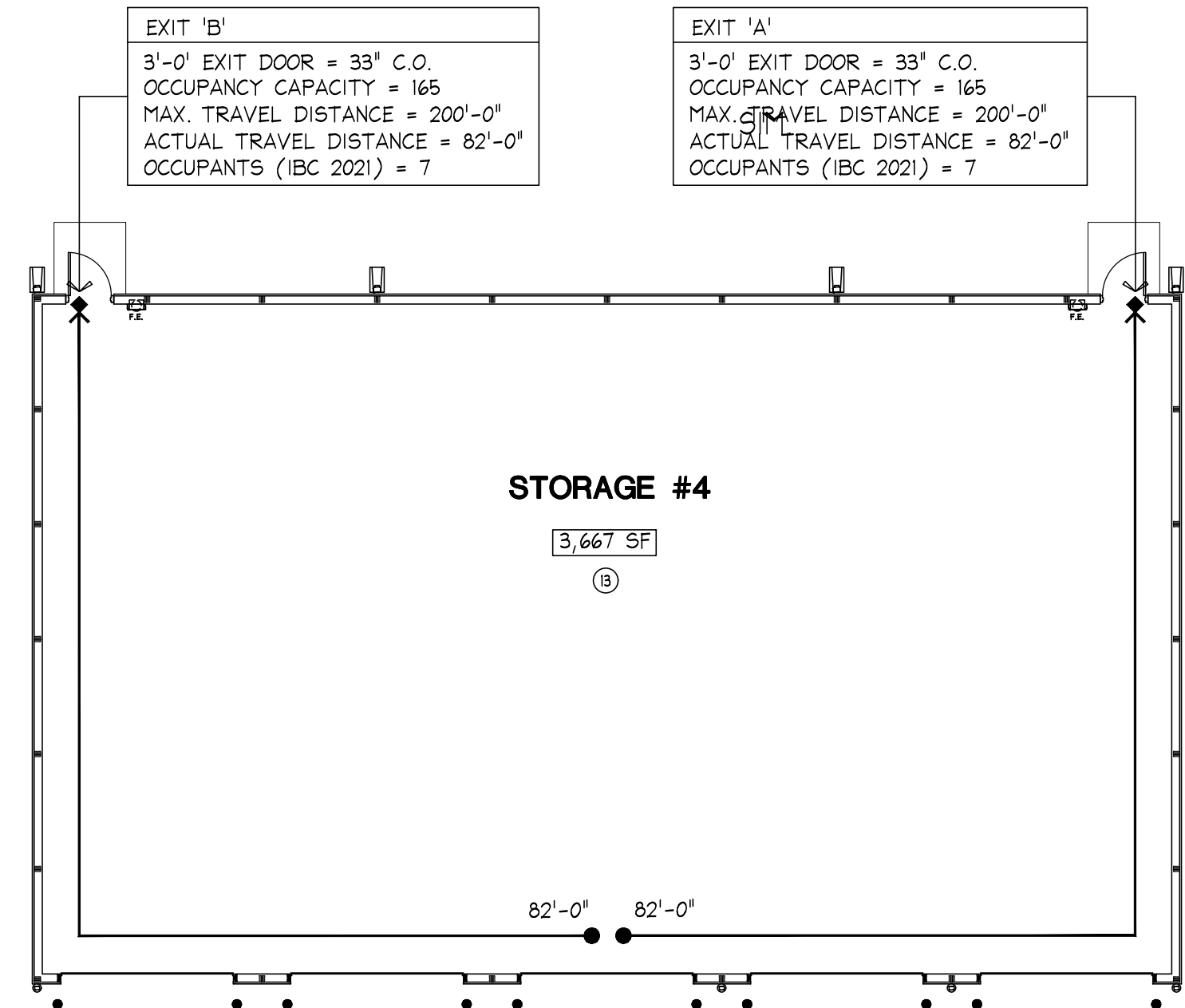
5. Final Verification Tests: Perform verification tests for UTP and optical fiber systems after the complete communications cabling and workstation outlet/connectors are installed.
 - a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device 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



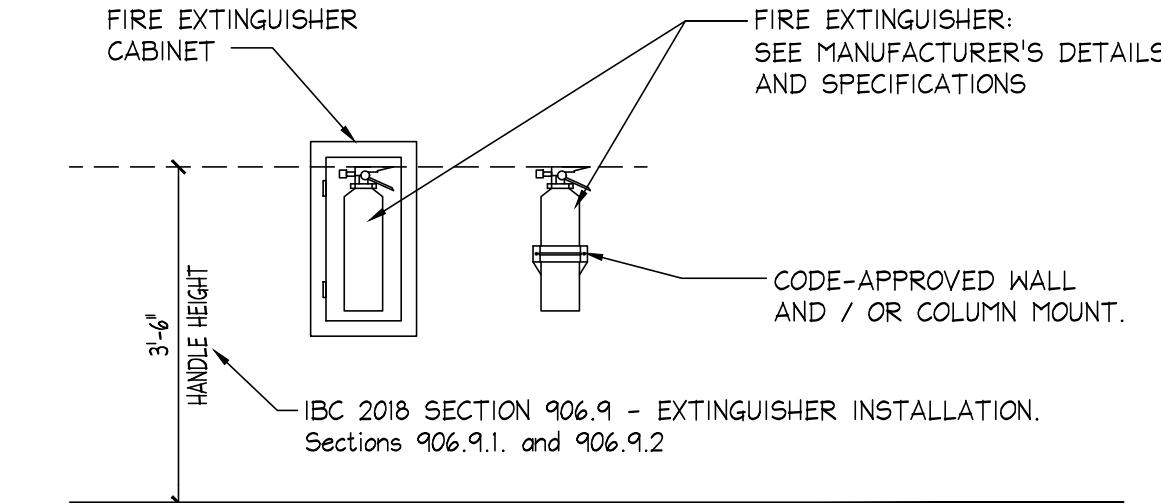
EGRESS PLAN - BUILDING A

SCALE: 3/32" = 1'-0"



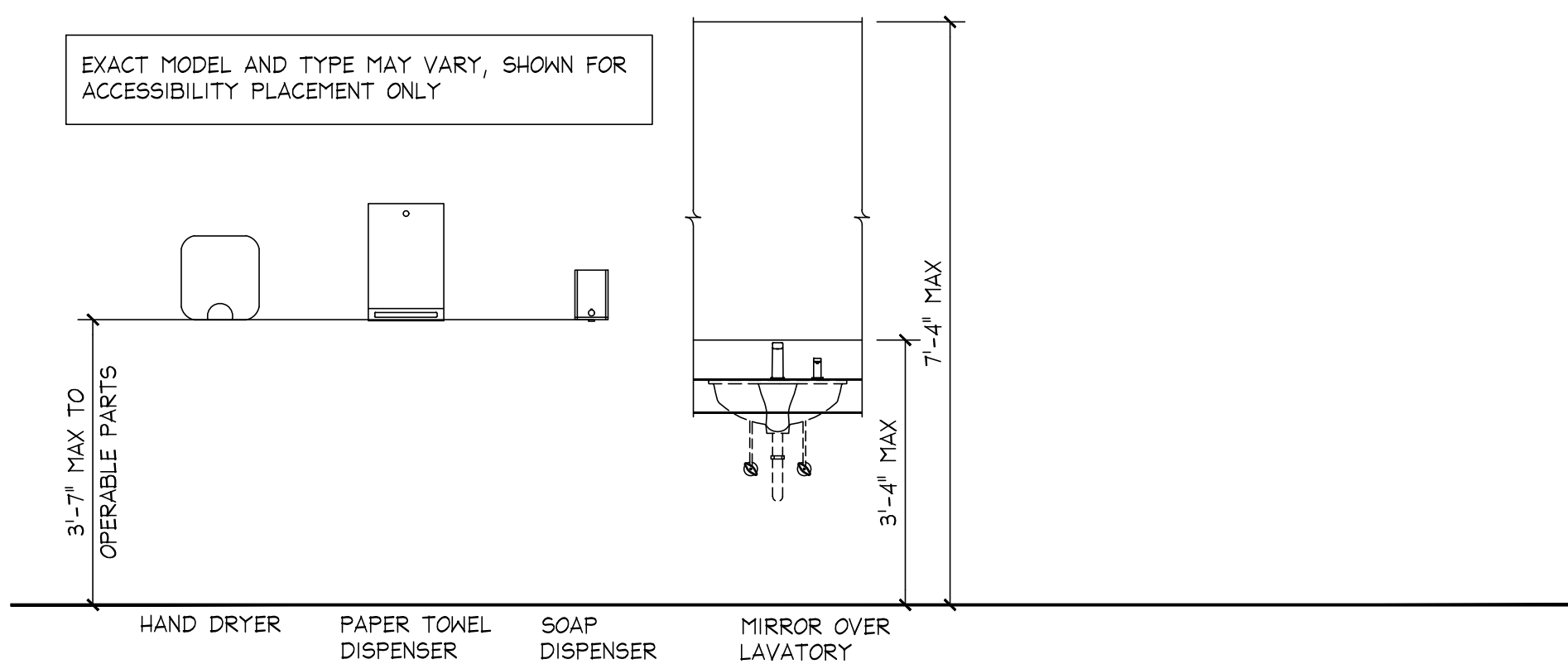
EGRESS PLAN - BUILDING B

SCALE: 3/32" = 1'-0"



FIRE EXTINGUISHER MOUNTING HEIGHTS

SCALE: 1/2" = 1'-0"



TOILET ROOM ACCESSORY MOUNTING HEIGHTS

N.T.S.

BUILDING DATA - BDG A

2021 INTERNATIONAL BUILDING CODE - NJ EDITION

PROJECT LOCATION

BLOCK(S):

LOT(S):

MUNICIPALITY: CITY OF VINELAND

USE GROUP(S) MAIN USE ACCESSORY USE

A-1 H-1 R-1 S-1

A-2 H-2 R-2 S-2

A-3 H-3 R-3 U

A-4 H-4 R-4

A-5 I-1

B I-2

E I-3

F-1 I-4

F-2 M

CONSTRUCTION CLASSIFICATION

1A (PROTECTED) 3A (PROTECTED)

1B (PROTECTED) 3B (UNPROTECTED)

2A (PROTECTED) 4 (HEAVY TIMBER)

2B (UNPROTECTED) 5A (PROTECTED)

2B (UNPROTECTED) 5B (UNPROTECTED)

GENERAL BUILDING LIMITATIONS

ALLOWABLE AREA (TABLE 506.2): 9,000 SF

STREET FRONTAGE INCREASE

(SECTION 506.3.3): 5,670 SF

TOTAL ALLOWABLE AREA: 14,670 SF

PROPOSED BUILDING AREA: 12,800 SF

BUILDING VOLUME: 256,000 CF

ALLOWABLE STORIES (TABLE 504.4): 1

ACTUAL STORIES: 1

ALLOWABLE BUILDING HEIGHT

(SECTION 504.3): 40'-0" FT

ACTUAL BUILDING HEIGHT: 21'-0" FT

UNLIMITED AREA BUILDING (SECTION 507)

FIRE PROTECTION SYSTEM

LIMITED AREA SPRINKLER SYSTEM

COMPLETE FIRE SUPPRESSION SYSTEM

ADDITIONAL INFORMATION

BUILDING DATA - BDG B

2021 INTERNATIONAL BUILDING CODE - NJ EDITION

PROJECT LOCATION

BLOCK(S):

LOT(S):

MUNICIPALITY: CITY OF VINELAND

USE GROUP(S) MAIN USE ACCESSORY USE

A-1 H-1 R-1 S-1

A-2 H-2 R-2 S-2

A-3 H-3 R-3 U

A-4 H-4 R-4

A-5 I-1

B I-2

E I-3

F-1 I-4

F-2 M

CONSTRUCTION CLASSIFICATION

1A (PROTECTED) 3A (PROTECTED)

1B (PROTECTED) 3B (UNPROTECTED)

2A (PROTECTED) 4 (HEAVY TIMBER)

2B (UNPROTECTED) 5A (PROTECTED)

2B (UNPROTECTED) 5B (UNPROTECTED)

GENERAL BUILDING LIMITATIONS

ALLOWABLE AREA (TABLE 506.2): 9,000 SF

STREET FRONTAGE INCREASE

(SECTION 506.3.3): 5,670 SF

TOTAL ALLOWABLE AREA: 14,670 SF

PROPOSED BUILDING AREA: 3,840 SF

BUILDING VOLUME: 84,480 CF

ALLOWABLE STORIES (TABLE 504.4): 1

ACTUAL STORIES: 1

ALLOWABLE BUILDING HEIGHT

(SECTION 504.3): 40'-0" FT

ACTUAL BUILDING HEIGHT: 20'-0" FT

UNLIMITED AREA BUILDING (SECTION 507)

FIRE PROTECTION SYSTEM

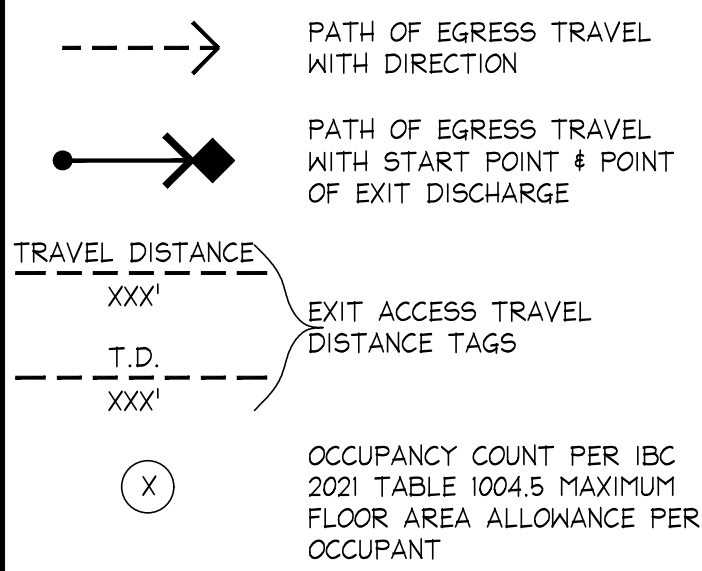
LIMITED AREA SPRINKLER SYSTEM

COMPLETE FIRE SUPPRESSION SYSTEM

ADDITIONAL INFORMATION

Revisions		
No.	Date	Description
1	04-07-26	GENERAL REVISIONS

LIFE SAFETY LEGEND



LIFE SAFETY NOTES

1. ALL TRAVEL DISTANCES ARE MEASURED FROM STARTING POINT TO EXIT DISCHARGE.
2. EGRESS PLAN INFORMATION SHOWN PRIMARILY FOR CODE REFERENCE; SEE FLOOR PLANS FOR ADDITIONAL CONSTRUCTION INFORMATION.

- NOTES:
1. SPACE WITH (1) EXIT MAX. TRAVEL DISTANCE OF 100'-0" WITH OCCUPANT LOAD LESS THAN 30 IN ACCORDANCE WITH IBC 2021-TABLE 1006-2.1; S-1 USE; NON-SPRINKLERED.
 2. SPACE WITH MORE THAN (1) EXIT MAX. TRAVEL DISTANCE OF 200'-0" IN ACCORDANCE WITH IBC 2021-TABLE 1017.2; S-1 USE; NON-SPRINKLERED.
 3. OCCUPANCY CAPACITY CALCULATED AT 0.2" PER OCCUPANT IN ACCORDANCE WITH IBC 2021 - SECTION 1005.3.2.

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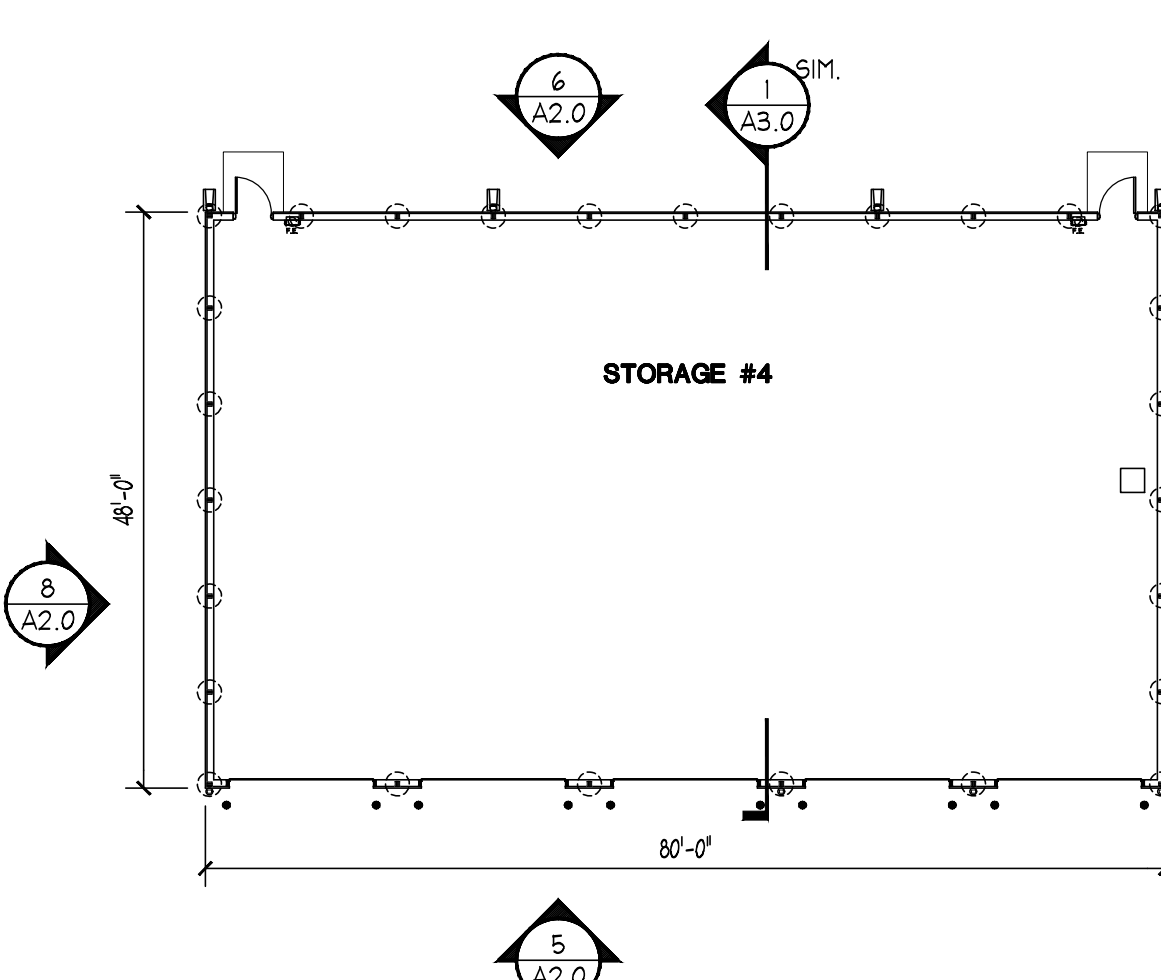
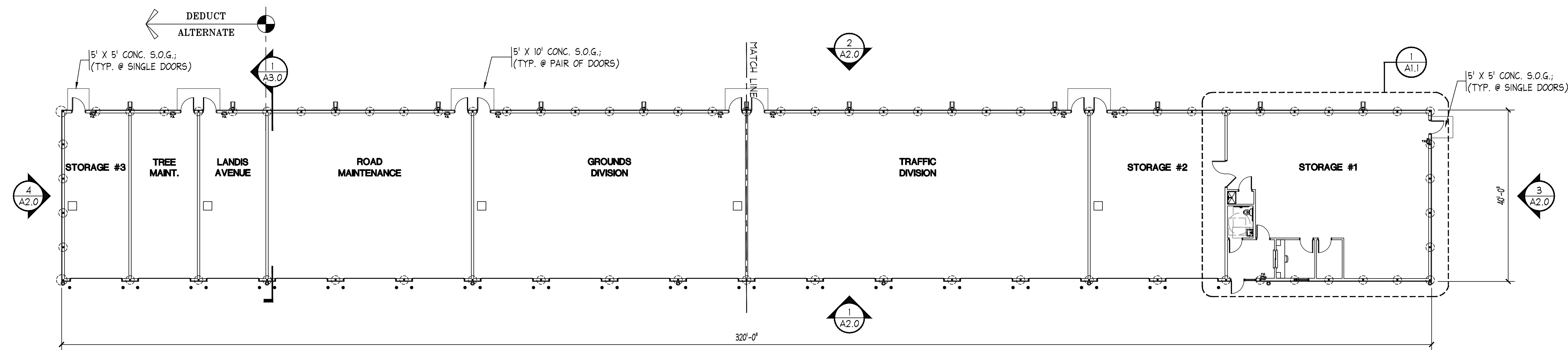
David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-09473
Ronald P. Portadin AIA AI-13038
Peter W. Farrell AIA AI-13618

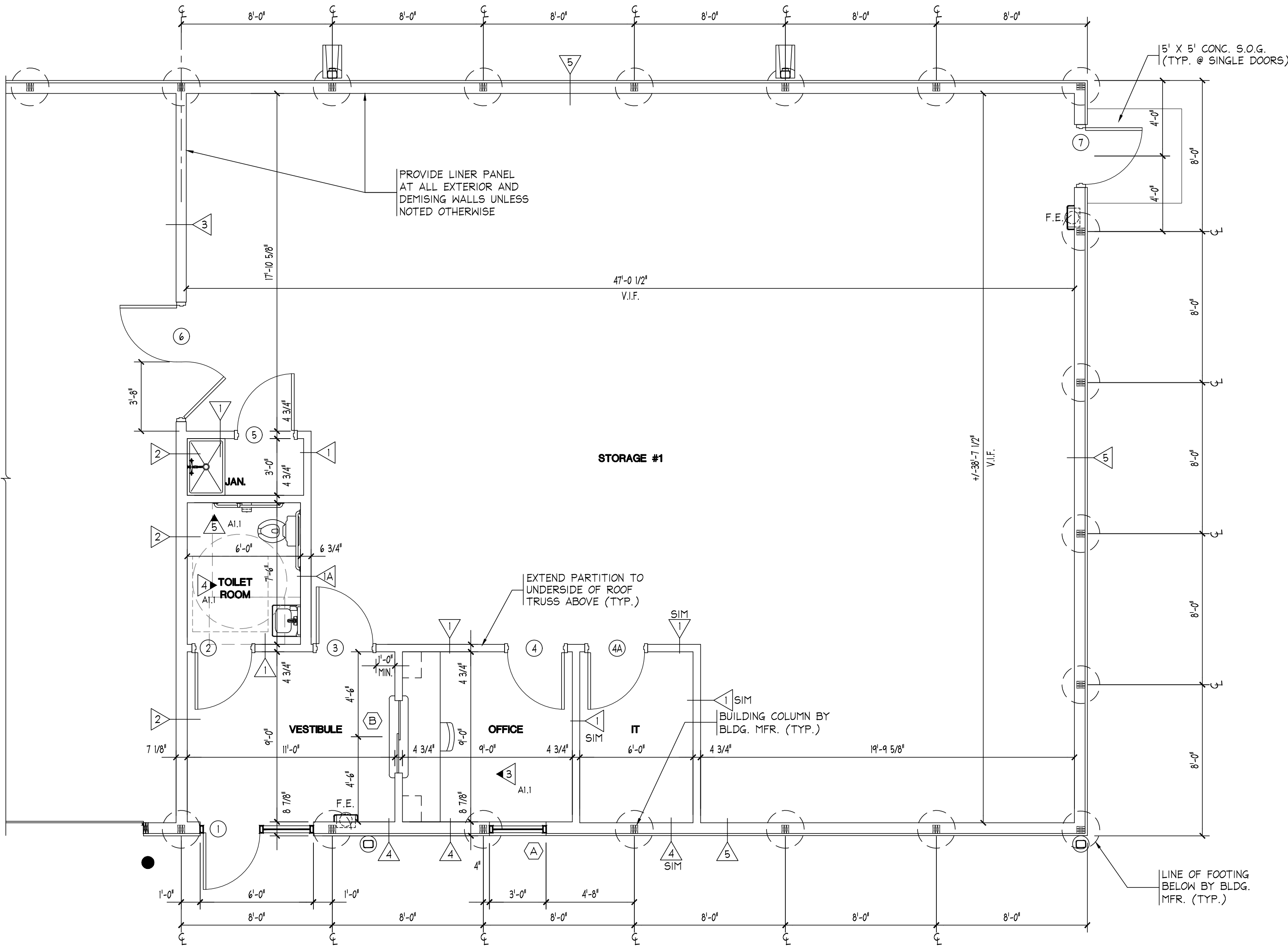
Project
NEW POLE BARN FOR
CITY OF VINELAND
PUBLIC WORKS

72 W. PARK AVE.
VINELAND, NJ 08360



Scale	Job	Sheet
AS NOTED	23,089	EG1.0
Drawn	Date	
ANA, EMS	10/08/24	1 of 5



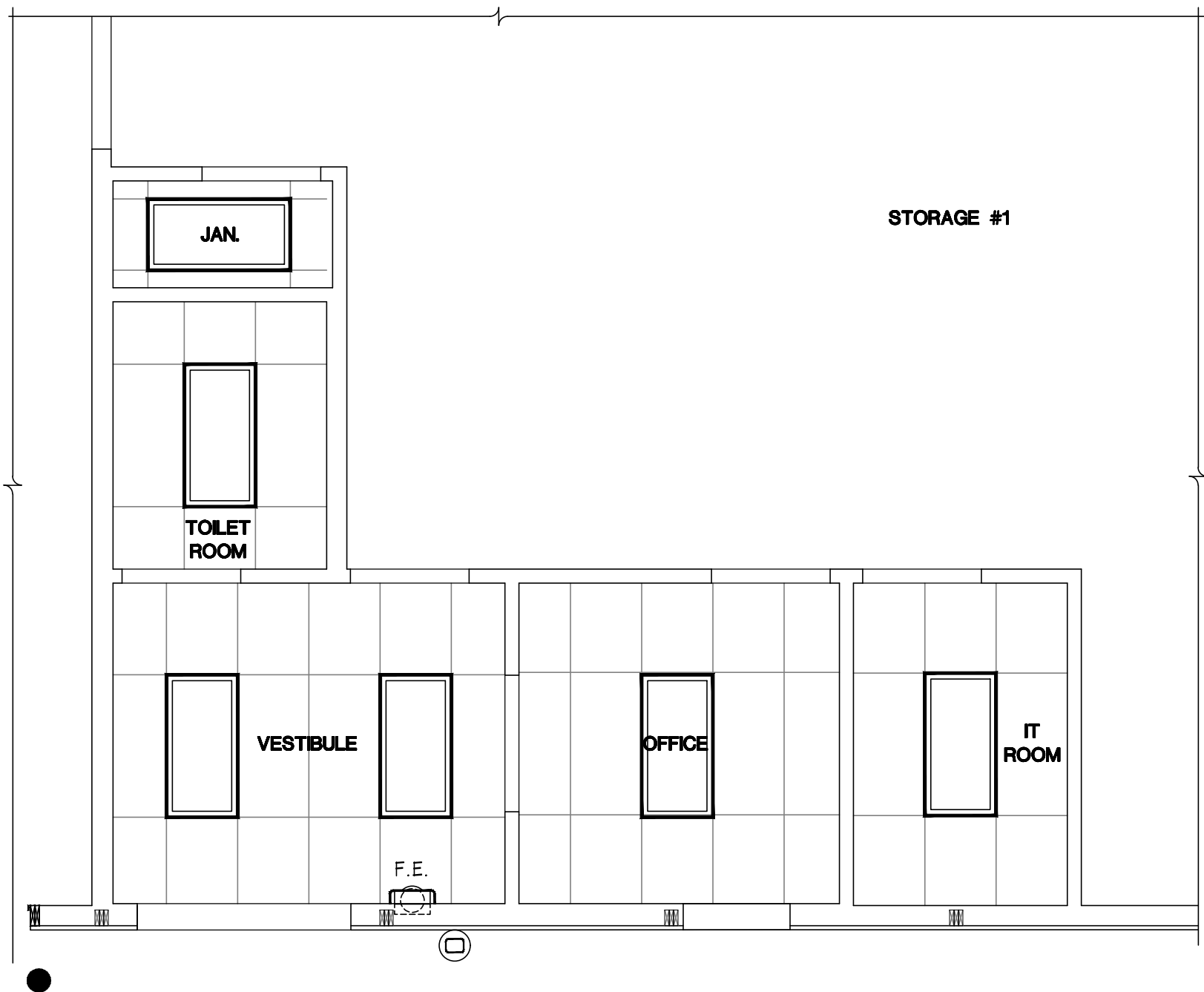


ENLARGED STORAGE #1 FLOOR PLAN

SCALE: 1/4" = 1'-0"

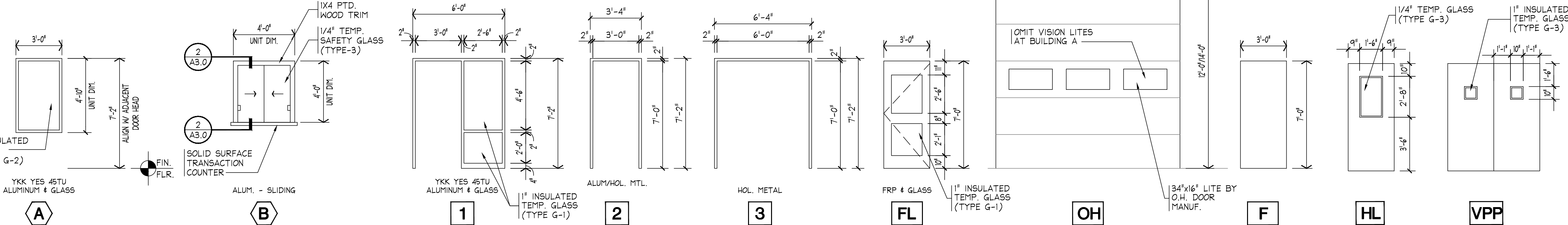
ROOM FINISH SCHEDULE						
ROOM NAME	FLOOR	BASE	WALL	CLG.	HEIGHT	REMARKS
VESTIBULE	WALK-OFF MAT	VINYL	PTD. G.W.B.	ACOUSTIC TILE	8'-0"	
OFFICE	VCT	VINYL	PTD. G.W.B.	ACOUSTIC TILE	8'-0"	
TOILET ROOM	VCT	VINYL	PTD. G.W.B.	ACOUSTIC TILE	8'-0"	
JANITOR CLOSET	VCT	VINYL	PTD. G.W.B.	ACOUSTIC TILE	8'-0"	
IT ROOM	VCT	VINYL	3/4" PLYWOOD	ACOUSTIC TILE	9'-0"	
STORAGE #1	SEALED CONC.	-----	LINER PANEL	LINER PANEL	16'-0"	
STORAGE #2	SEALED CONC.	-----	LINER PANEL	LINER PANEL	16'-0"	
TRAFFIC DIVISION	SEALED CONC.	-----	LINER PANEL	LINER PANEL	16'-0"	
ROADS DIVISION	SEALED CONC.	-----	LINER PANEL	LINER PANEL	16'-0"	
ROAD MAINT.	SEALED CONC.	-----	LINER PANEL	LINER PANEL	16'-0"	
LANDIS AVE.	SEALED CONC.	-----	LINER PANEL	LINER PANEL	16'-0"	
TREE MAINT.	SEALED CONC.	-----	LINER PANEL	LINER PANEL	16'-0"	
STORAGE #3	SEALED CONC.	-----	LINER PANEL	LINER PANEL	16'-0"	
STORAGE #4	SEALED CONC.	-----	LINER PANEL	LINER PANEL	16'-0"	

- NOTES:
- COORDINATE ALL FINISH SELECTIONS/LOCATIONS WITH OWNER.
 - PROVIDE 6" UNFACED INSULATION BATTS ABOVE ALL ACOUSTICAL TILE CEILINGS.
 - LINER PANEL BY BUILDING MANUFACTURER.
 - SEE SPECIFICATION SECTION 033000 FOR INFORMATION ON CONCRETE FLOOR SLAB SEALER



STORAGE #1 REFLECTED CEILING PLAN

SCALE: 1/4" = 1'-0"



WINDOW TYPES

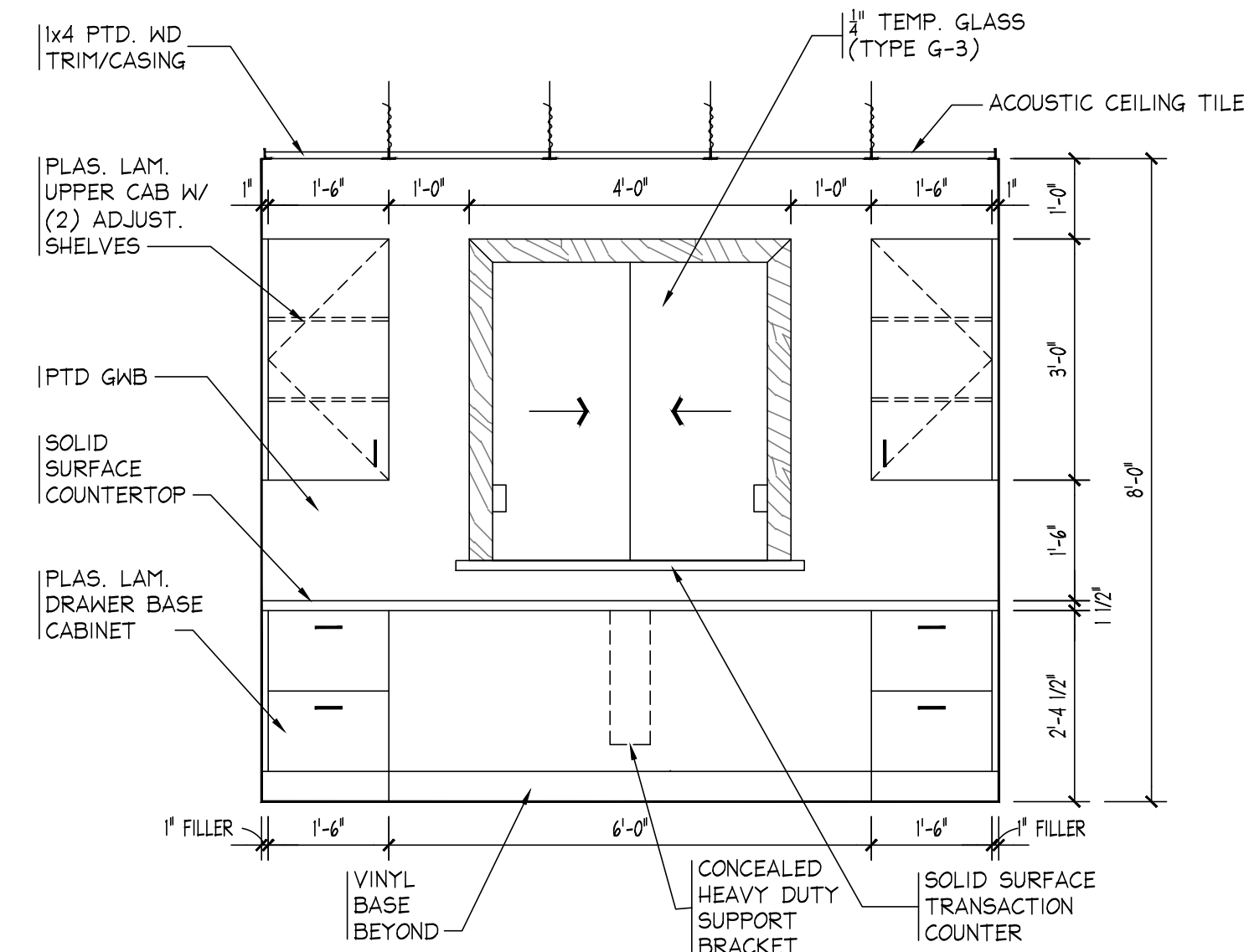
SCALE: 1/8" = 1'-0"

FRAME TYPES

SCALE: 1/8" = 1'-0"

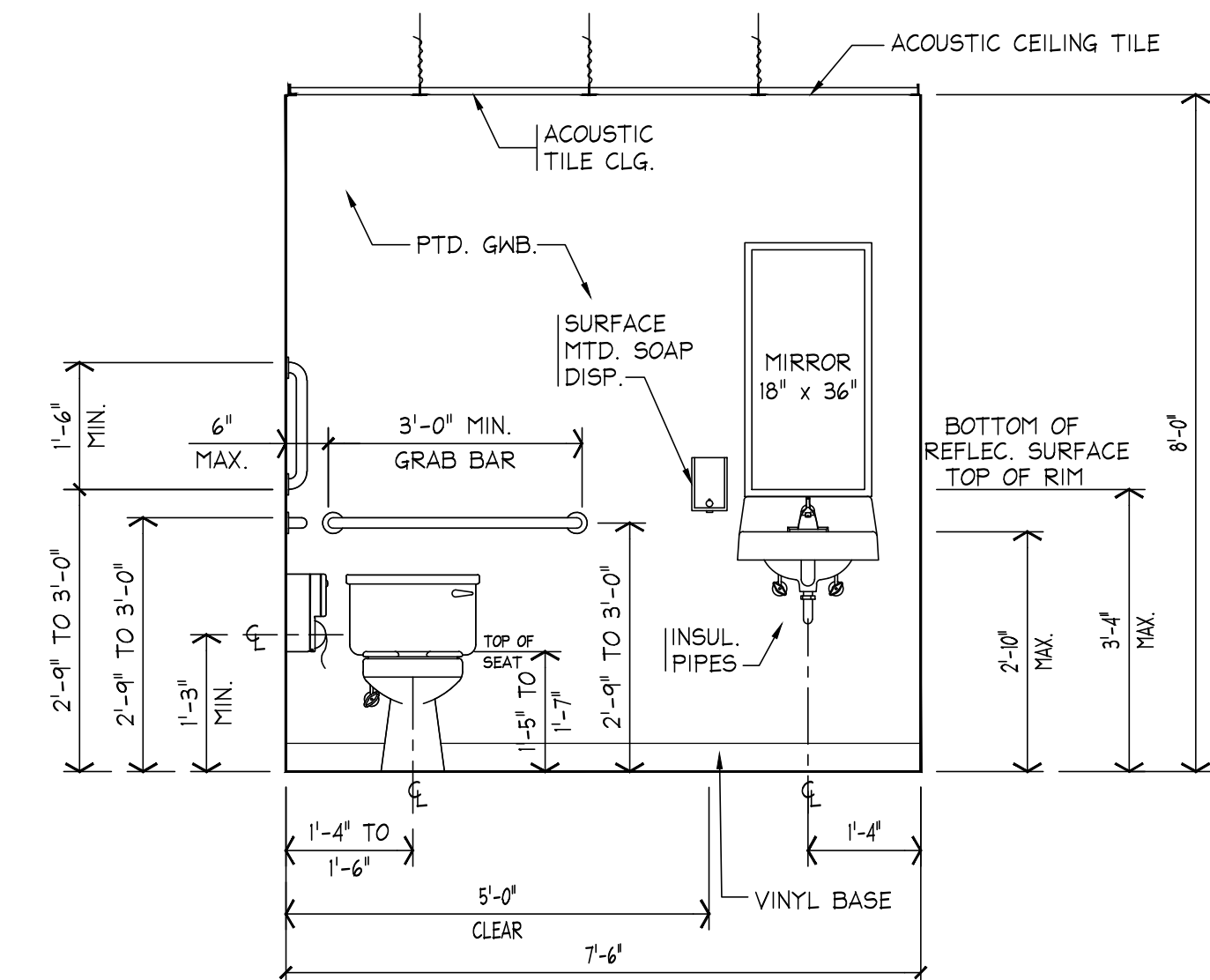
DOOR TYPES

SCALE: 1/8" = 1'-0"



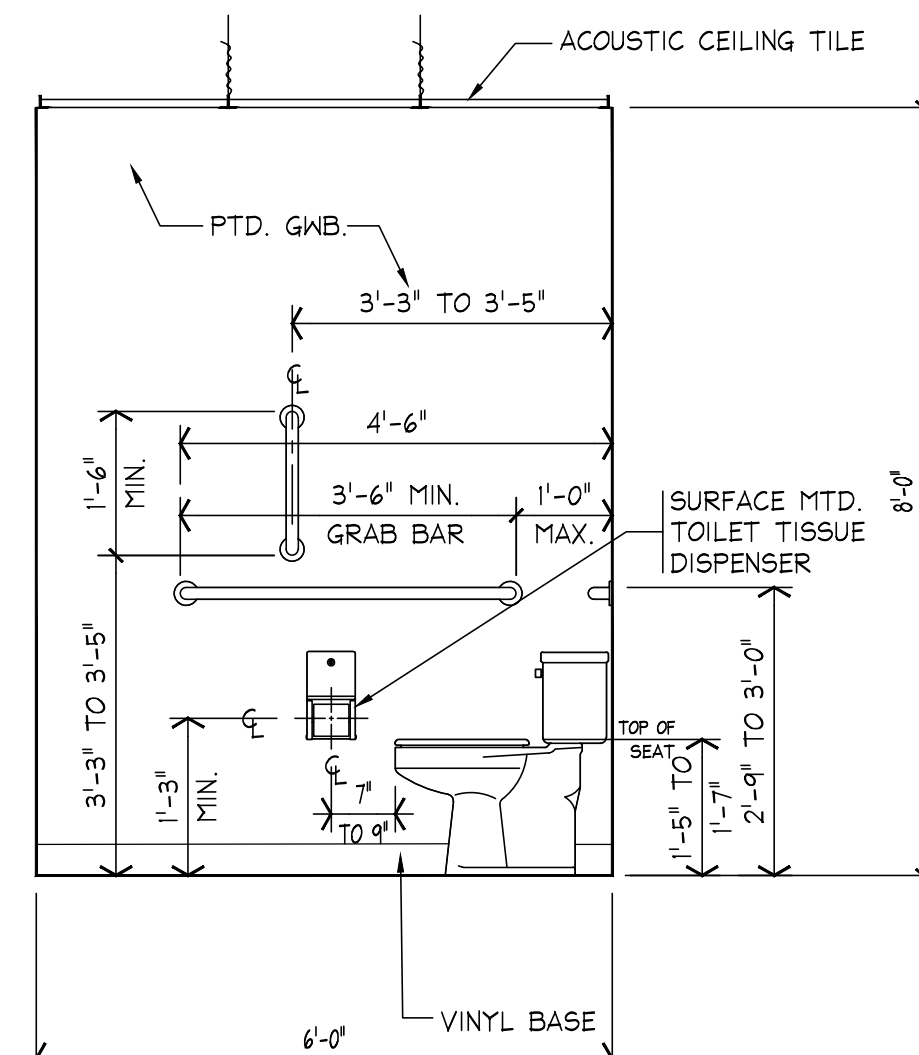
OFFICE ELEVATION

SCALE: 1/2" = 1'-0"



T.R. ELEVATION

SCALE: 1/2" = 1'-0"



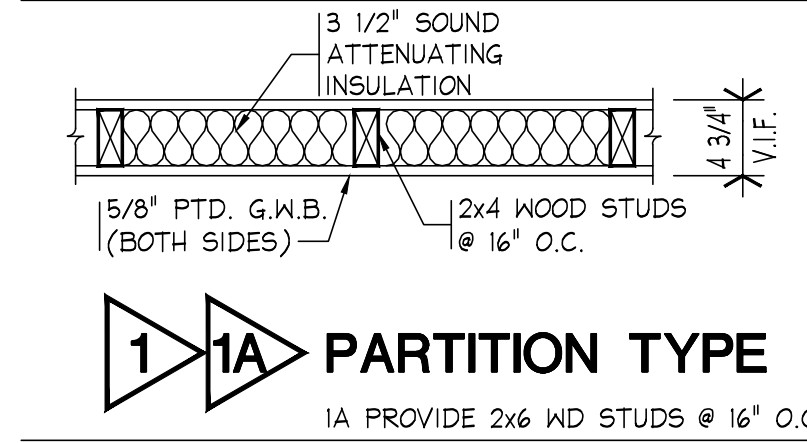
T.R. ELEVATION

SCALE: 1/2" = 1'-0"

DOOR SCHEDULE - BUILDING A												
NO.	WIDTH	HEIGHT	THK.	MATERIAL	FINISH	DOOR TYPE	FRAME MATERIAL	FINISH	HDW.	FRAME NO.	FRAME TYPE	REMARKS
1	3'-0"	7'-0"	2"	FRP	MFR.	FL	ALUMINUM	MFR.	1	1		
2	3'-0"	7'-0"	1 3/4"	HOL. MTL.	PTD.	F	HOL. MTL.	PTD.	6	2		
3	3'-0"	7'-0"	1 3/4"	HOL. MTL.	PTD.	HL	HOL. MTL.	PTD.	7	2		
4	3'-0"	7'-0"	1 3/4"	HOL. MTL.	PTD.	HL	HOL. MTL.	PTD.	4	2		
4A	3'-0"	7'-0"	1 3/4"	HOL. MTL.	PTD.	F	HOL. MTL.	PTD.	7	2		
5	3'-0"	7'-0"	1 3/4"	HOL. MTL.	PTD.	F	HOL. MTL.	PTD.	2	2		
6	(2) 3'-0"	7'-0"	1 3/4"	HOL. MTL.	PTD.	VPP	HOL. MTL.	PTD.	5	3		
7	3'-0"	7'-0"	1 3/4"	FRP	MFR.	F	ALUM.	MFR.	1	2		
8	12'-0"	12'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MANUAL OPERATION
9	12'-0"	12'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MANUAL OPERATION
10	12'-0"	12'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MANUAL OPERATION
11	12'-0"	12'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MANUAL OPERATION
12	12'-0"	12'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MANUAL OPERATION
13	12'-0"	12'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MANUAL OPERATION
14	12'-0"	12'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MANUAL OPERATION
15	12'-0"	12'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MANUAL OPERATION
16	12'-0"	12'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MANUAL OPERATION
17	12'-0"	12'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MANUAL OPERATION
18	12'-0"	12'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MANUAL OPERATION
19	12'-0"	12'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MANUAL OPERATION
20	12'-0"	12'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MANUAL OPERATION
21	12'-0"	12'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MANUAL OPERATION
22	12'-0"	12'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MANUAL OPERATION
23	12'-0"	12'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MANUAL OPERATION
24	12'-0"	12'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MANUAL OPERATION
25	3'-0"	7'-0"	1 3/4"	FRP	MFR.	F	ALUM.	MFR.	1	2		
26	3'-0"	7'-0"	1 3/4"	FRP	MFR.	F	ALUM.	MFR.	1	2		
27	3'-0"	7'-0"	1 3/4"	FRP	MFR.	F	ALUM.	MFR.	1	2		
28	3'-0"	7'-0"	1 3/4"	FRP	MFR.	F	ALUM.	MFR.	1	2		
29	3'-0"	7'-0"	1 3/4"	FRP	MFR.	F	ALUM.	MFR.	1	2		
29A	3'-0"	7'-0"	1 3/4"	FRP	MFR.	F	ALUM.	MFR.	1	2		
30	3'-0"	7'-0"	1 3/4"	FRP	MFR.	F	ALUM.	MFR.	1	2		
30A	3'-0"	7'-0"	1 3/4"	FRP	MFR.	F	ALUM.	MFR.	1	2		
31	3'-0"	7'-0"	1 3/4"	FRP	MFR.	F	ALUM.	MFR.	1	2		

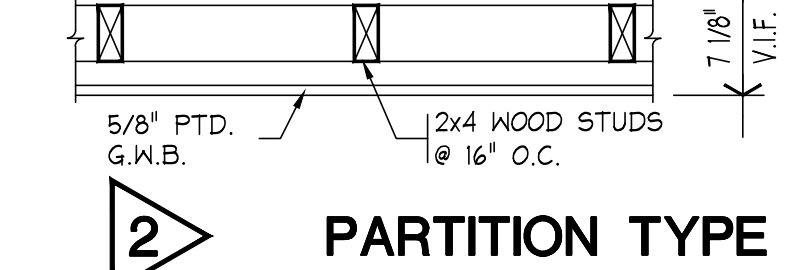
DOOR SCHEDULE - BUILDING B												
NO.	WIDTH	HEIGHT	THK.	MATERIAL	FINISH	DOOR TYPE	FRAME MATERIAL	FINISH	HDW.	FRAME NO.	FRAME TYPE	REMARKS
32	12'-0"	14'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MOTORIZED OPERATION
33	12'-0"	14'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MOTORIZED OPERATION
34	12'-0"	14'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MOTORIZED OPERATION
35	12'-0"	14'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MOTORIZED OPERATION
36	12'-0"	14'-0"		BY BLDG. MFR.		OH	BY BLDG. MFR.		8	-		MOTORIZED OPERATION
37	3'-0"	7'-0"	1 3/4"	FRP	MFR.	F	ALUM.	MFR.	1	2		
37A	3'-0"	7'-0"	1 3/4"	FRP	MFR.	F	ALUM.	MFR.	1	2		

- NOTES:
- ALL DOOR HARDWARE TO CONFORM TO NJ UCC BARRIER-FREE SUBCODE
 - COORDINATE ALL HARDWARE AND KEYING W/ OWNER.
 - PROVIDE CEILING MOUNTED 1/2 HP TROLLEY OPERATORS AT ALL MOTOR OPERATED OVERHEAD DOORS; PROVIDE (2) REMOTE OPERATORS FOR EACH DOOR LOCATION
 - OVERHEAD DOORS, HARDWARE AND MOTORIZED OPERATORS BY BUILDING MANUFACTURER. SEE SPECIFICATION FOR ADDITIONAL INFORMATION. PROVIDE STANDARD MANUAL OPERATING HARDWARE AT BUILDING A OVERHEAD DOORS; COORDINATE LOCKING REQUIREMENTS WITH OWNER.

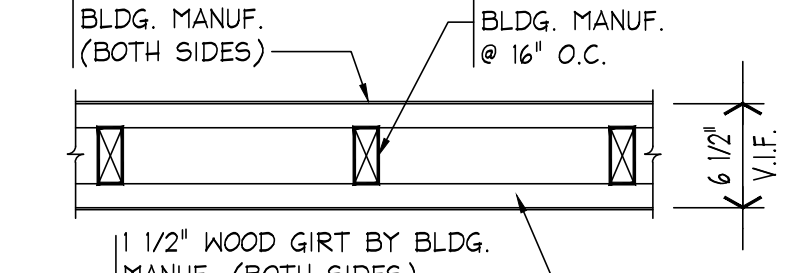


PARTITION TYPE 1A

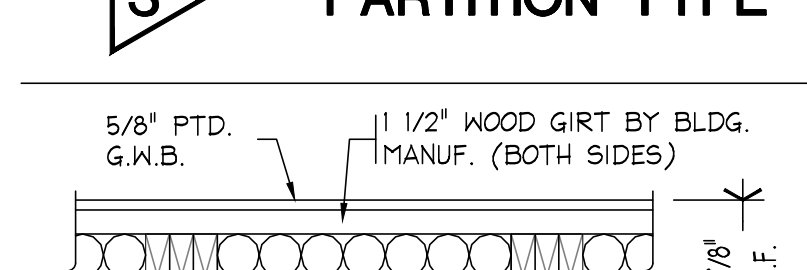
1A PROVIDE 2x6 WD STUDS @ 16" O.C.



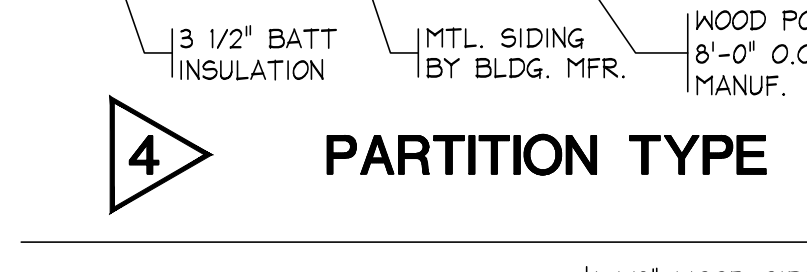
PARTITION TYPE 2



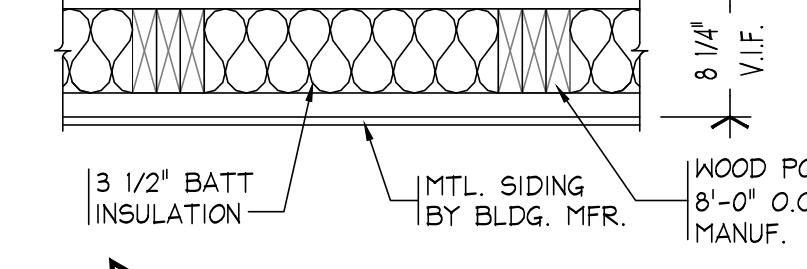
PARTITION TYPE 3



PARTITION TYPE 4



PARTITION TYPE 5



PARTITION TYPE 6

Revisions		
No.	Date	Description
1	04-07-26	GENERAL REVISIONS

- NOTES:
- PROVIDE/INSTALL MOISTURE & MOLD RESISTANT G.W.B. IN ALL TOILET ROOMS AND JANITORS CLOSETS.
 - EXTEND PERIMETER PARTITIONS OF FINISHED OFFICE AREA(S) TO UNDERSIDE OF ROOF STRUCTURE ABOVE.
 - OVERHEAD DOORS (BY BUILDING MANUF.) ARE TO BE MANUFACTURED BY G.H.I. OVERHEAD DOORS; MODEL NO. 3265 OR APPROVED EQUAL. MOTORIZED OPERATOR TO BE MANUFACTURED BY RATNOR; CONTROL HOIST STANDARD COMMERCIAL OPERATOR OR APPROVED EQUAL. 1/2 HP. DOOR FINISH TO BE SELECTED BY ARCHITECT. SEE SPECIFICATION FOR ADDITIONAL INFORMATION.
 - AT EACH OVERHEAD DOOR LOCATION PROVIDE/INSTALL STANDARD (3) BUTTON WALL MOUNTED CONTROL STATION WITH OPEN/STOP/CLOSED ADJUNCT TO OVERHEAD DOOR (TYP.)
 - PROVIDE 3/4" PLYWOOD IN LIEU OF 5/8" PTD. G.W.B. IN IT ROOM - ALL WALLS FULL HEIGHT.
 - OMIT VISION LITES AT BUILDING A OVERHEAD DOORS

GLAZING TYPES

TYPE	DESCRIPTION
G-1	1" INSULATED TEMPERED
G-2	1" INSULATED
G-3	1/4" TEMPERED

SEE SPECIFICATION FOR ADDITIONAL INFORMATION ON GLAZING TYPES.

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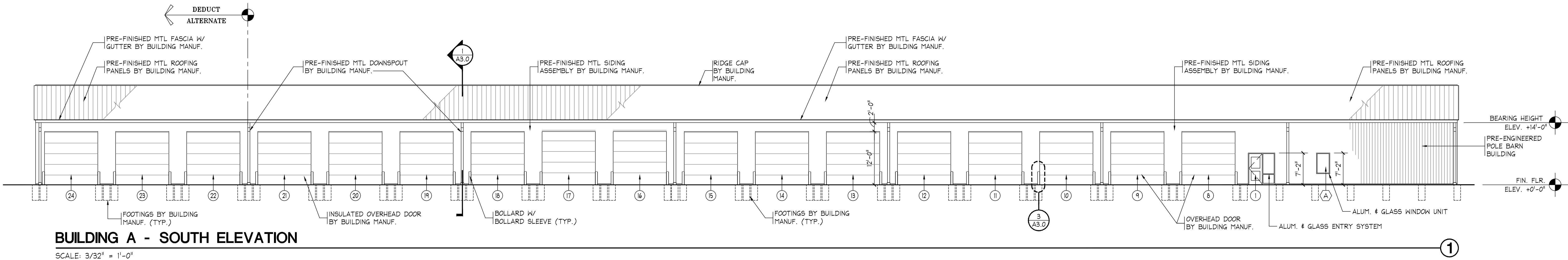
Project

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VINELAND, NJ 08360

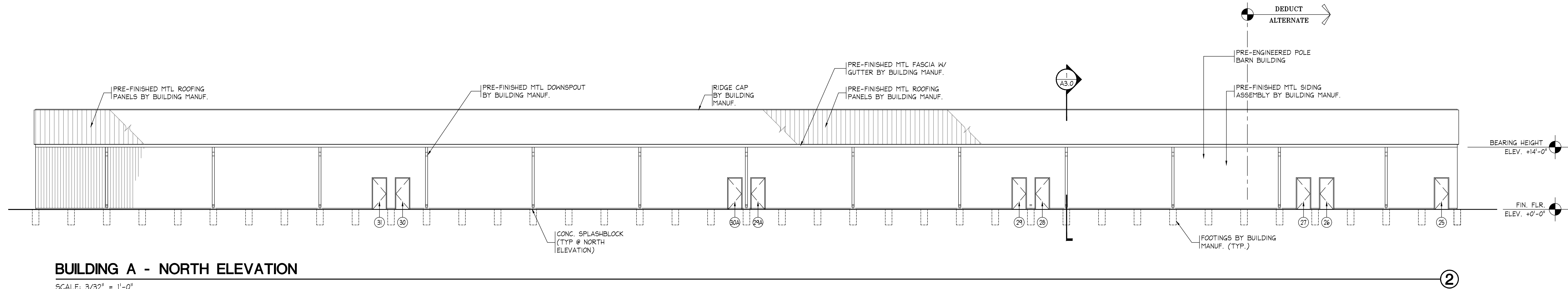
Drawing
ENLARGED FLOOR PLAN,
REFLECTED CEILING PLAN,
PARTITION TYPES,
SCHEDULES, DOOR, FRAME,
& WINDOW TYPES

Scale	Job	Sheet
AS NOTED	23.089	A1.1
Drawn	Date	
NDZ/CSM	10/08/24	3 of 5



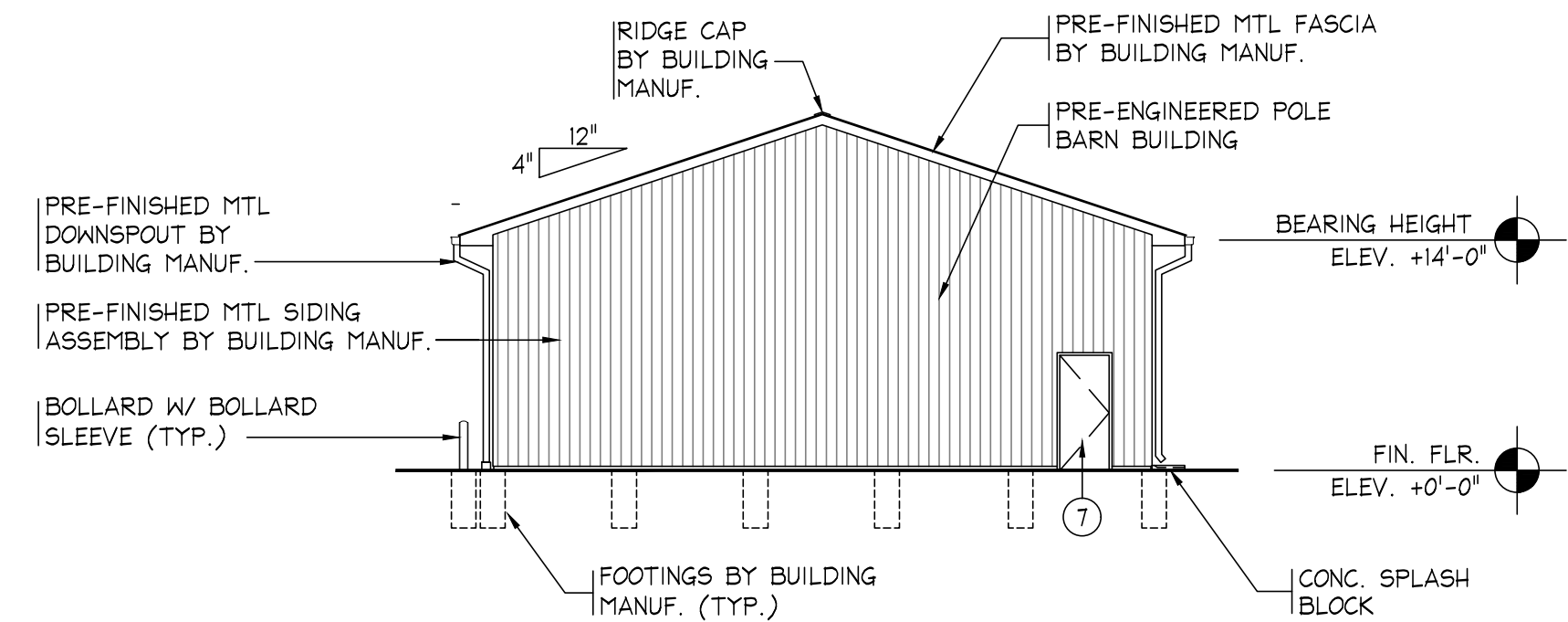
BUILDING A - SOUTH ELEVATION

SCALE: 3/32" = 1'-0"



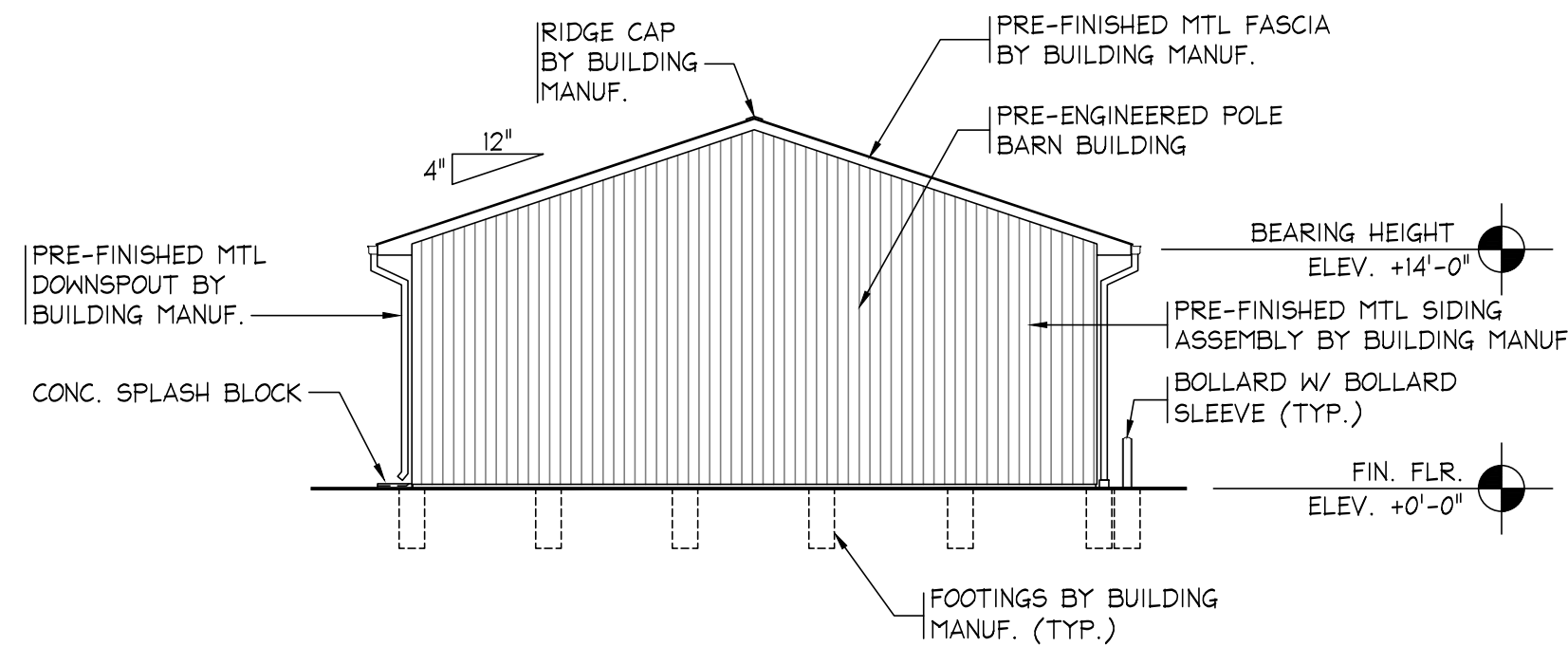
BUILDING A - NORTH ELEVATION

SCALE: 3/32" = 1'-0"



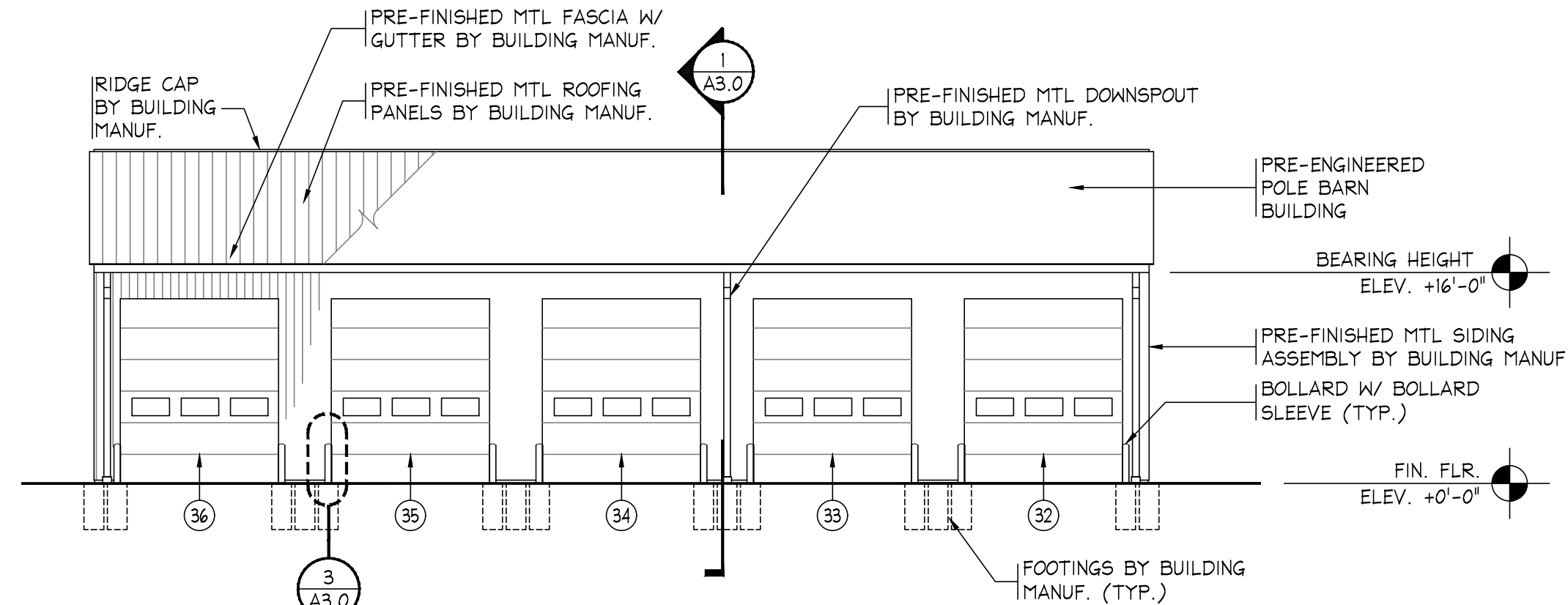
BUILDING A - WEST ELEVATION

SCALE: 3/32" = 1'-0"



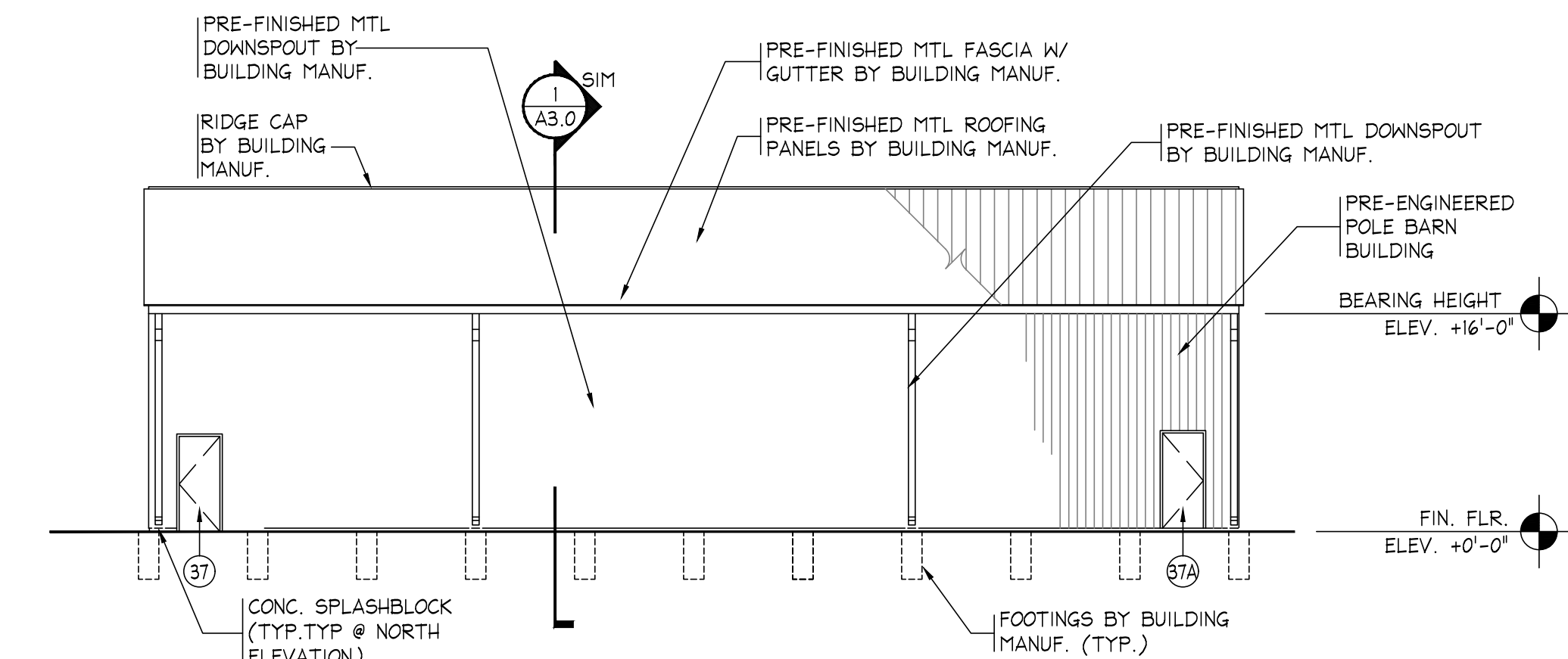
BUILDING A - EAST ELEVATION

SCALE: 3/32" = 1'-0"



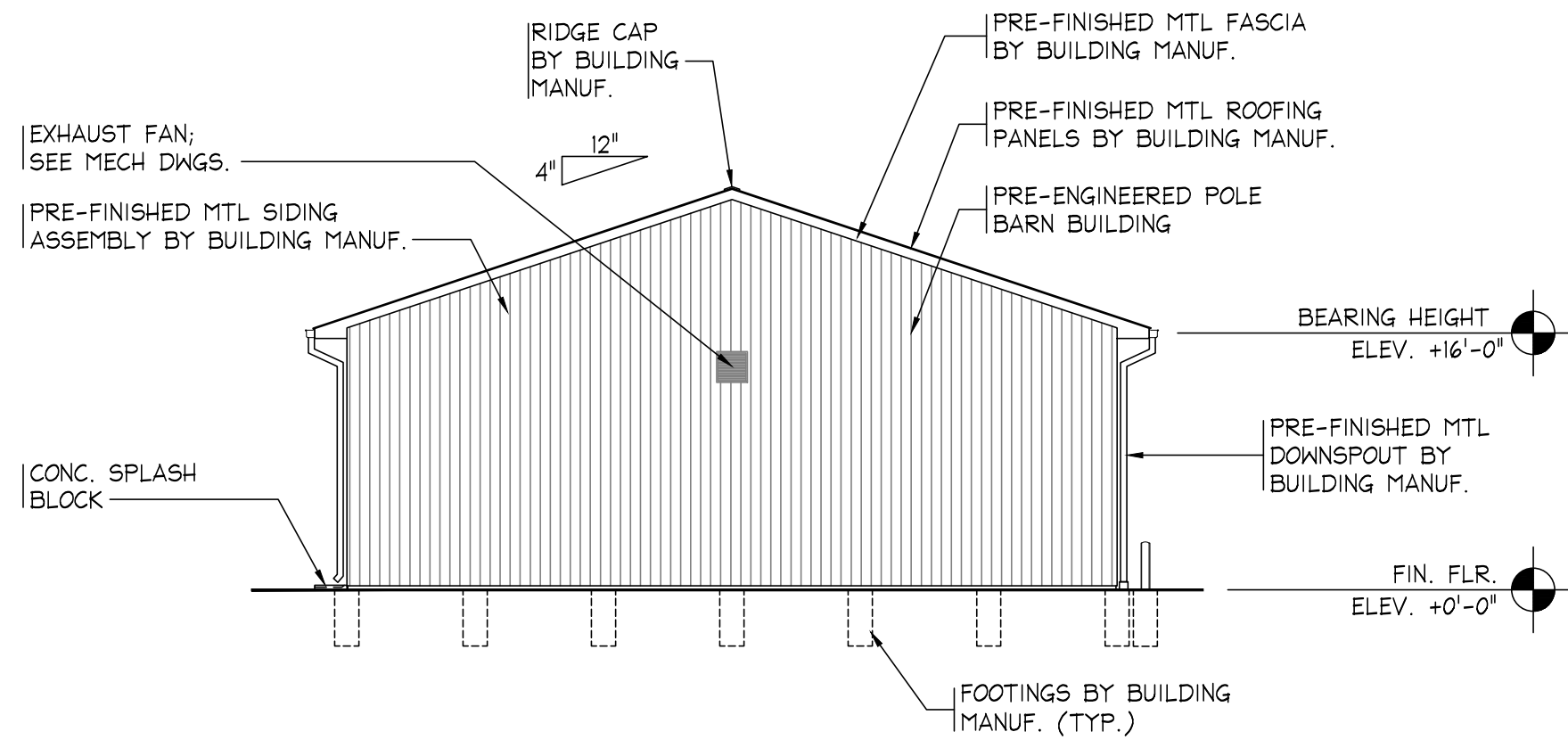
BUILDING B - SOUTH ELEVATION

SCALE: 3/32" = 1'-0"



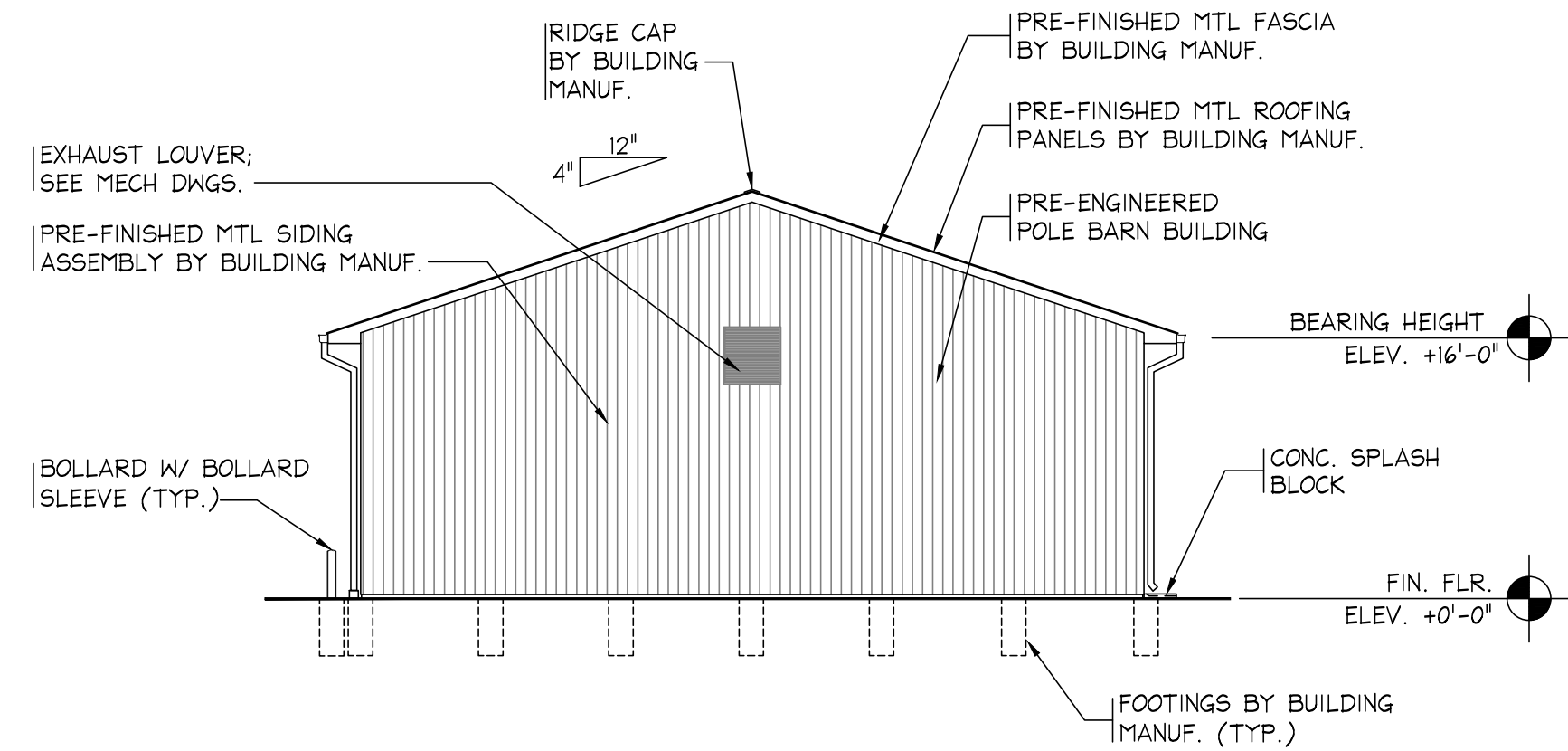
BUILDING B - NORTH ELEVATION

SCALE: 3/32" = 1'-0"



BUILDING B - WEST ELEVATION

SCALE: 3/32" = 1'-0"



BUILDING B - EAST ELEVATION

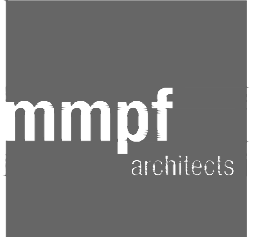
SCALE: 3/32" = 1'-0"

Revisions		
No.	Date	Description
1	04-07-26	GENERAL REVISIONS

NOTES:
1. BOLLARD SLEEVES TO BE MANUFACTURED BY IDEAL SHIELD OR APPROVED EQUAL. 1/2" THK. POLYETHYLENE THERMOPLASTIC SLEEVE, SMOOTH FINISH, SIZE/DIAMETER AS INDICATED ON DRAWINGS; COLOR SELECTED BY ARCHITECT.
2. SEE SPECIFICATIONS FOR INFORMATION ON ALL ALTERNATES

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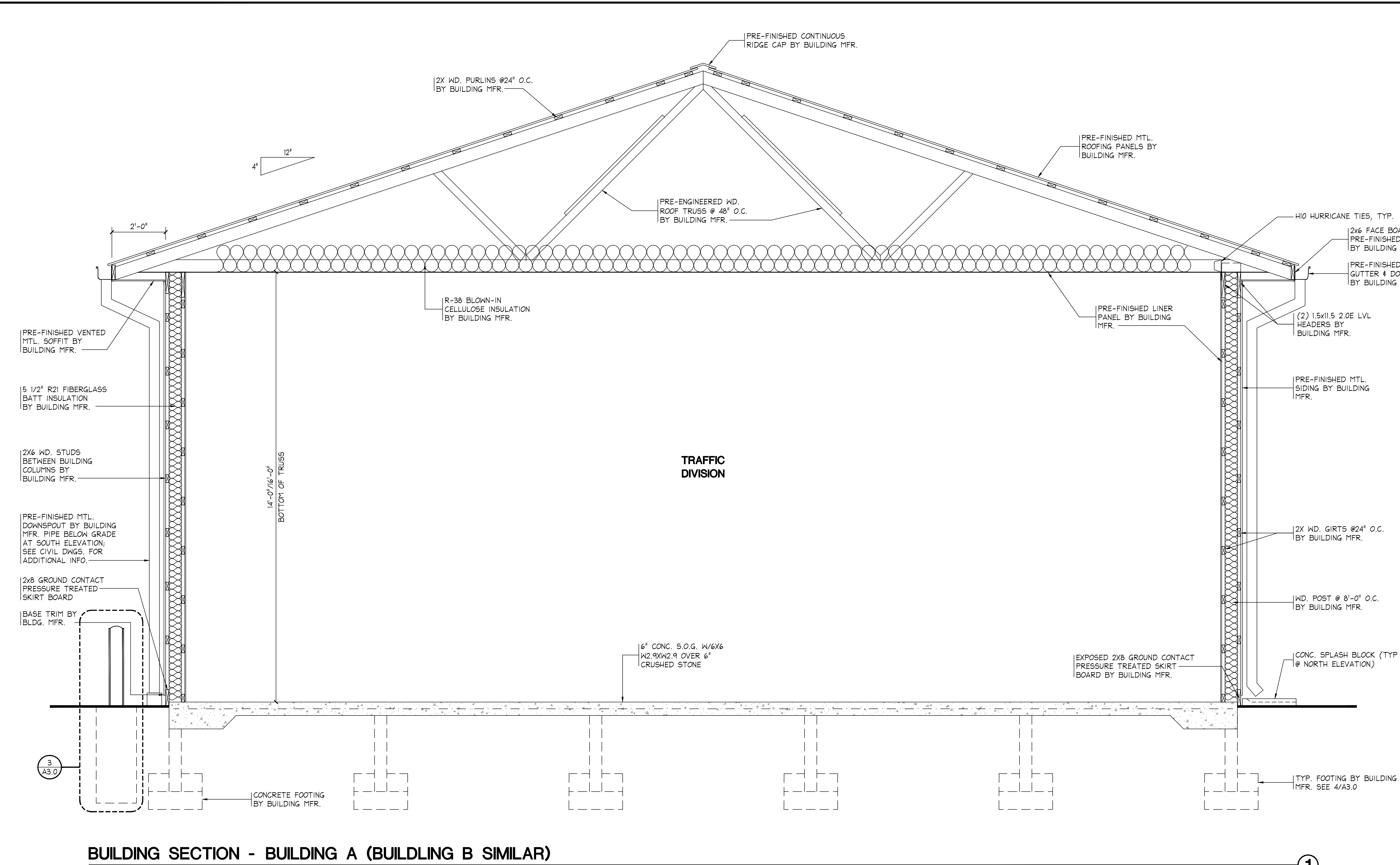
David G. Manders AIA AI-07220
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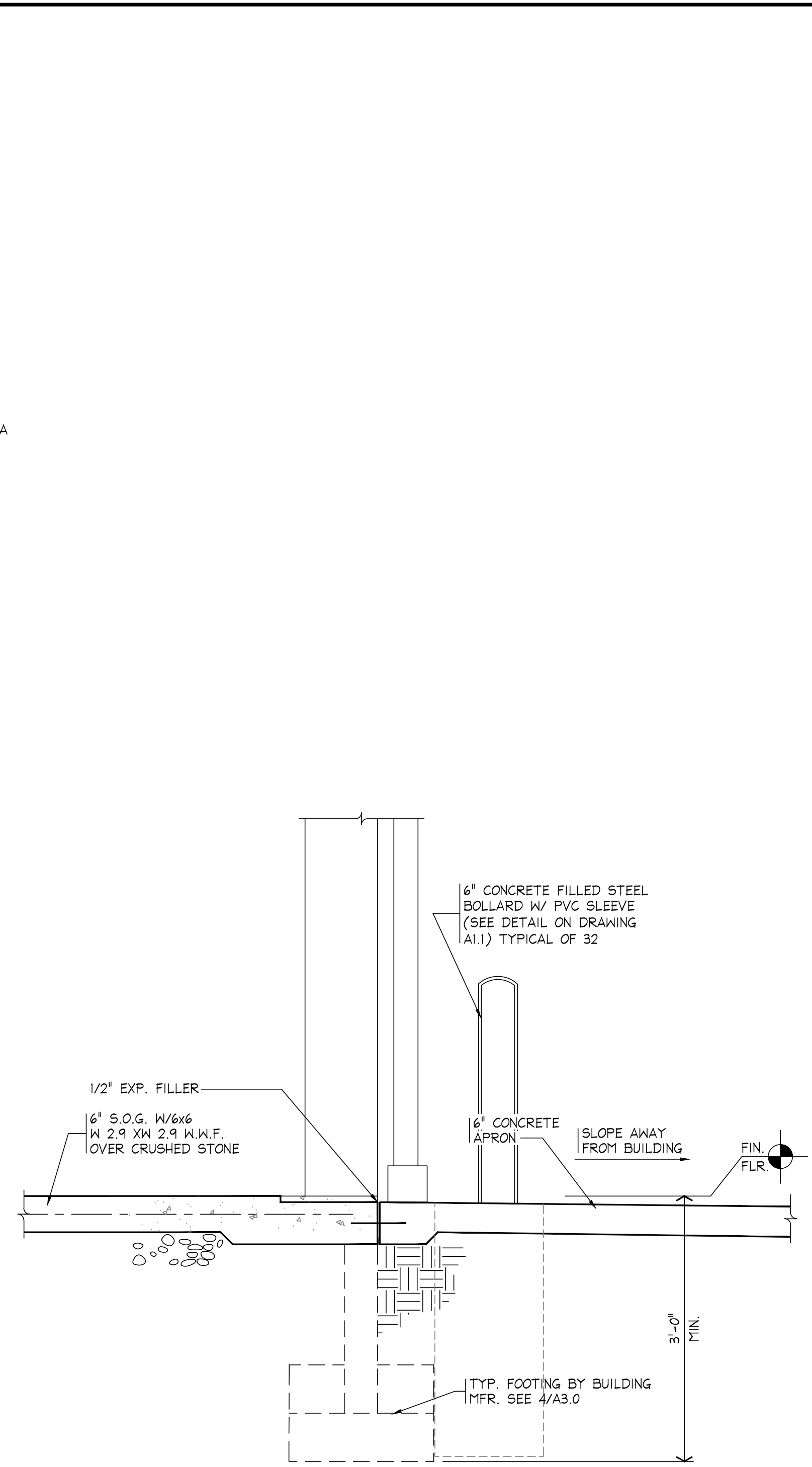
Drawing
BUILDING ELEVATIONS

Scale	Job	Sheet
AS NOTED	23.089	A2.0
Drawn	Date	
NDZ/ANA/CSM	10/08/24	4 of 5



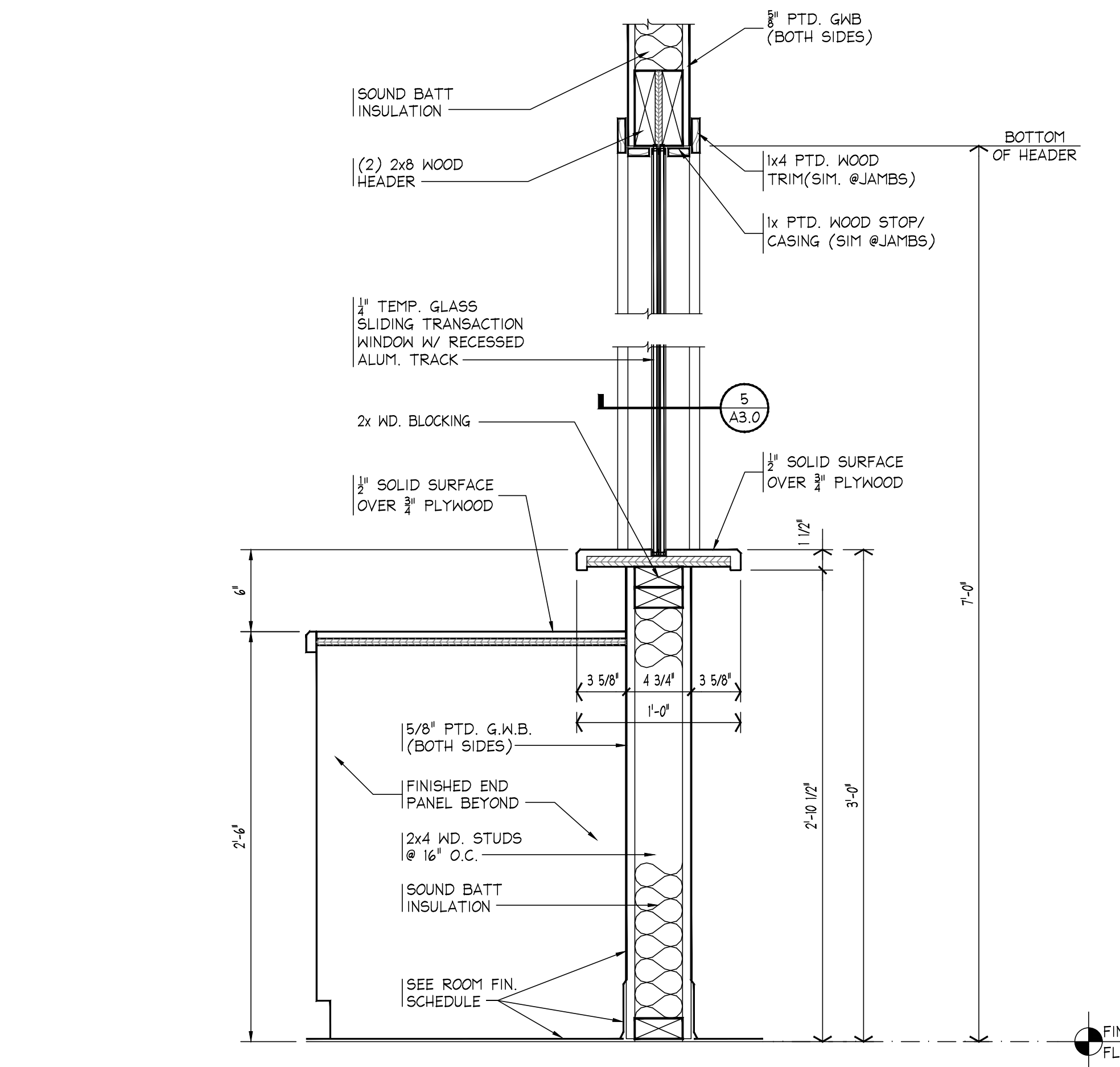
BUILDING SECTION - BUILDING A (BUILDING B SIMILAR)

SCALE: 1/2" = 1'-0"



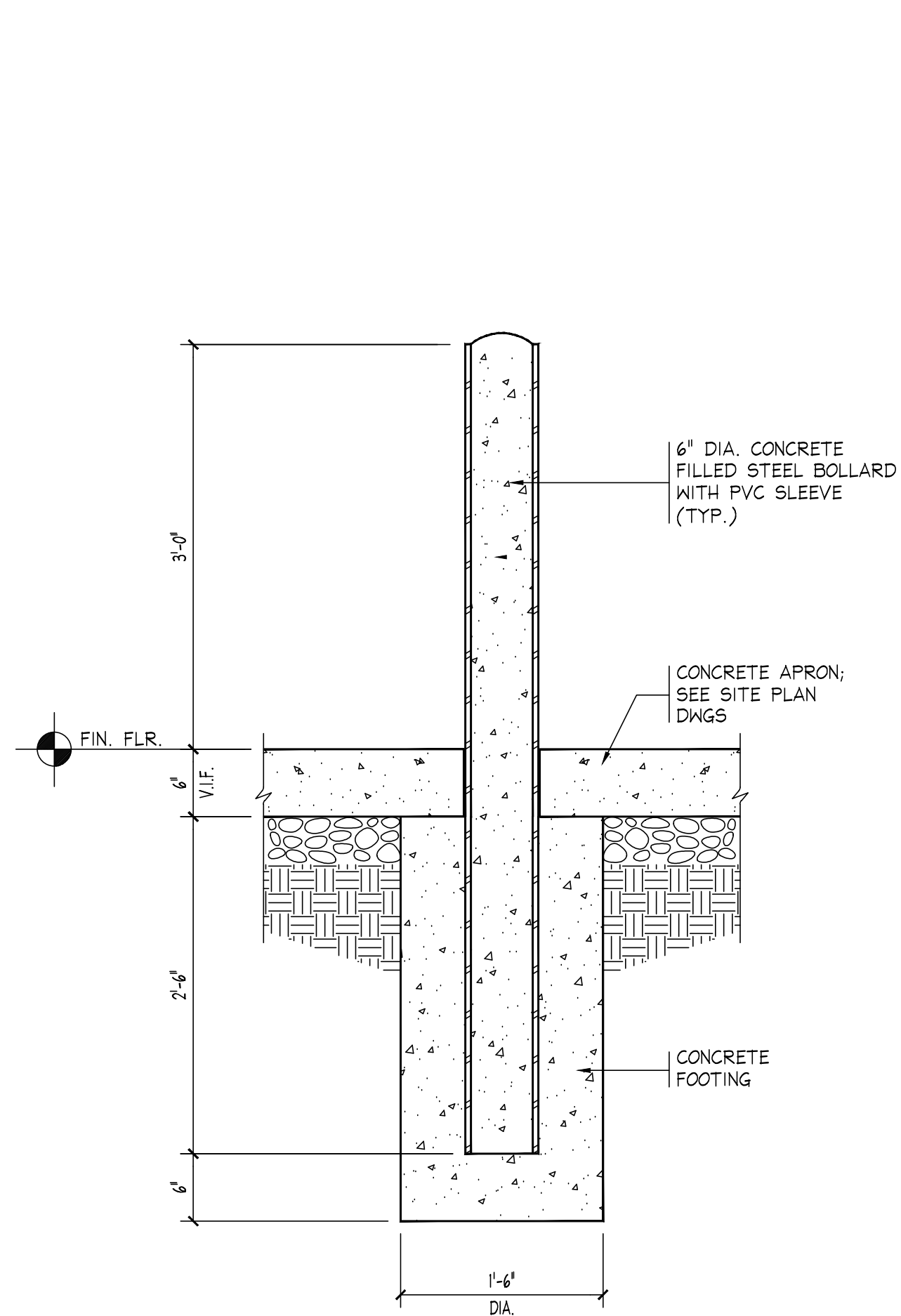
WALL SECTION @ OVERHEAD DOOR

SCALE: 3/4" = 1'-0"



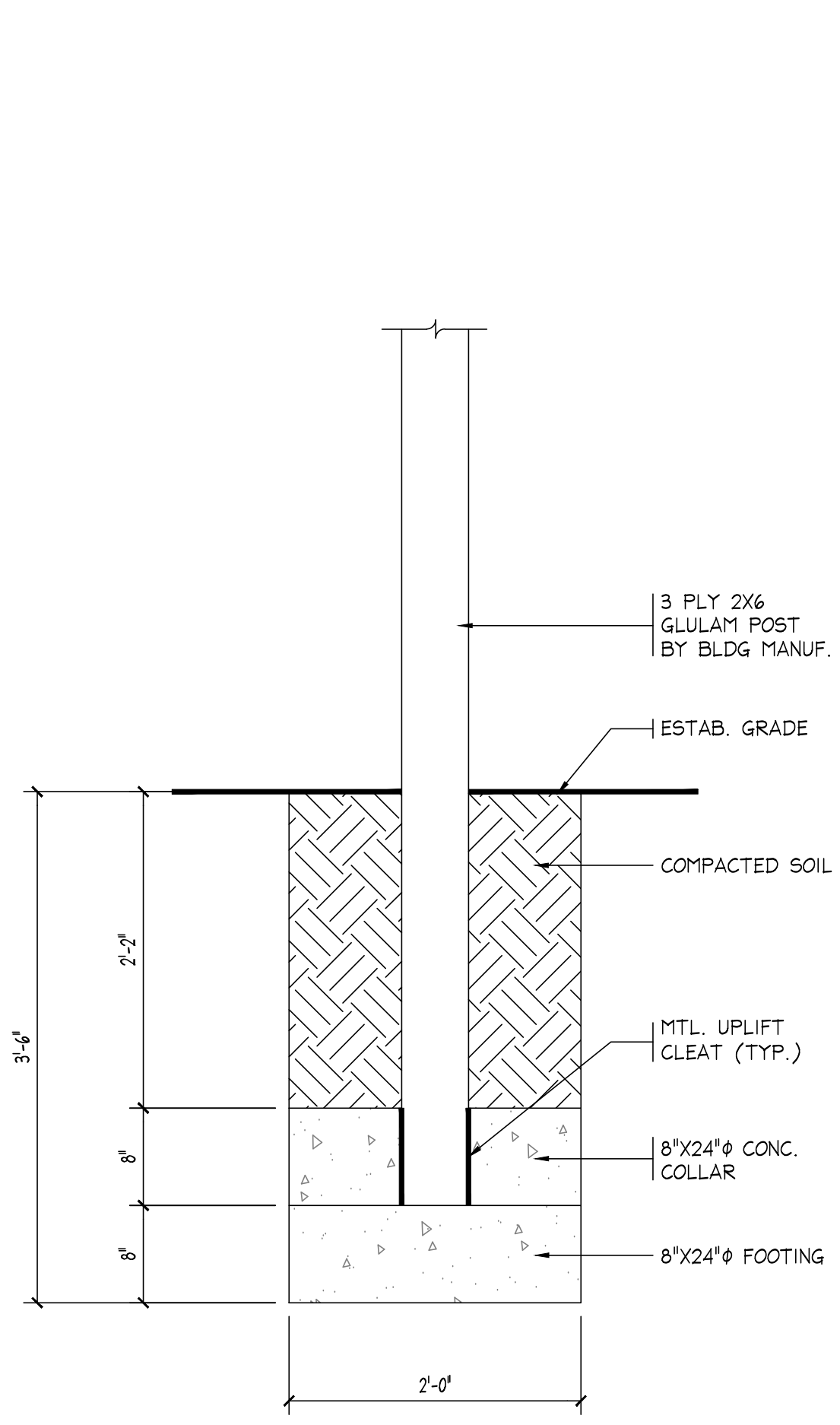
TRANSACTION WINDOW DETAIL

SCALE: 1/2" = 1'-0"



BOLLARD DETAIL

SCALE: 1" = 1'-0"

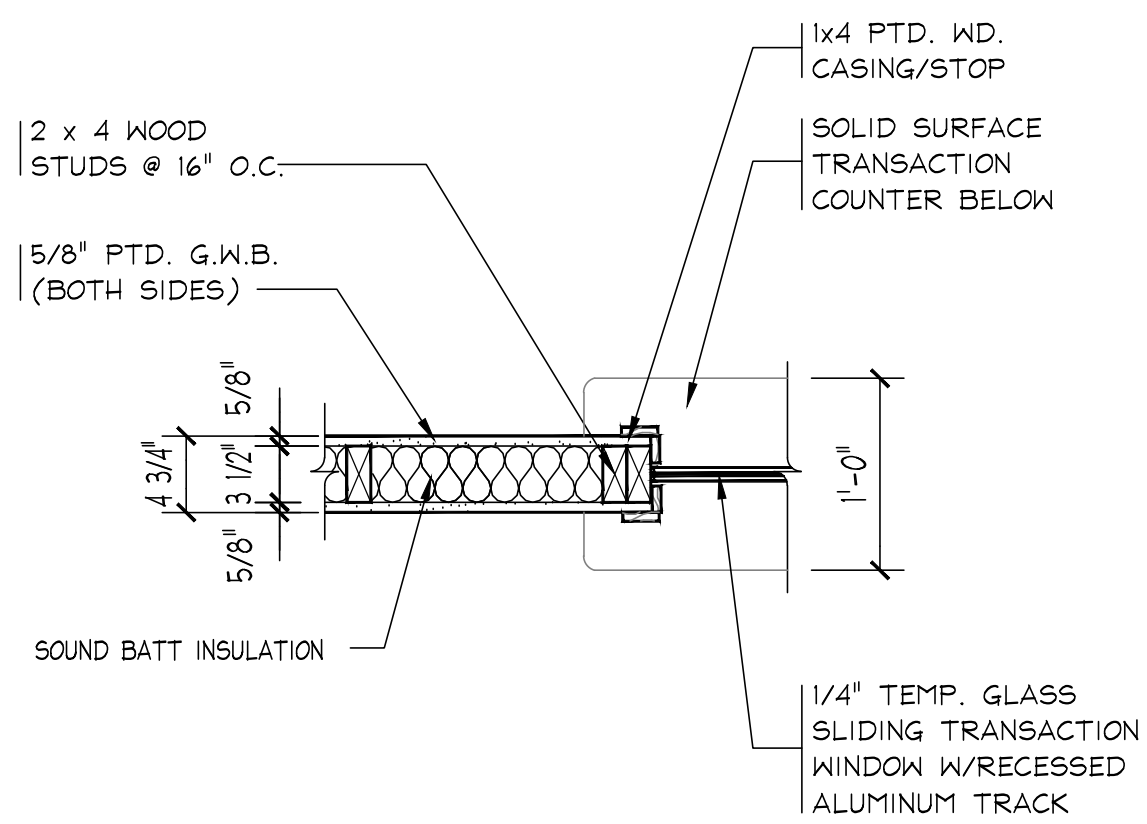


FOUNDATION DETAIL

SCALE: 1" = 1'-0"

TOILET ROOM ACCESSORY SCHEDULE								
ROOM NAME	(B-1)	(B-2)	(B-3)	(H-1)	(M-1)	(S-1)	(P-1)	(T-1)
	GRAB BARS	GRAB BARS	GRAB BARS	MOP HOOK	MIRROR	SOAP DISPENSER	PAPER TOWEL DISPENSER	TOILET TISSUE DISPENSER
PUBLIC WORKS OFFICE T.R.	(1)	(1)	(1)	-	(1)	(1)	(1)	(1)
JANITOR'S CLOSET	-	-	-	(1)	-	-	-	-

NOTES: 1. LISTED 'B' MODEL NO.5 ARE BY 'BOBRICK' - STAINLESS STL. W/ SATIN FINISH UNLESS NOTED OTHERWISE
2. GC TO PROVIDE WOOD BLOCKING FOR ALL OWNER SUPPLIED TOILET ROOM ACCESSORIES; COORDINATE FINAL LOCATION WITH OWNER INSTALLATION OF OWNER PROVIDED ACCESSORIES IS BY G.C.



JAMB DETAIL

SCALE: 1" = 1'-0"

Revisions		
No.	Date	Description
1	04-07-26	GENERAL REVISIONS

NOTES:
1. G.C. TO PROVIDE AND INSTALL ATTIC DRAFTSTOPPING IN ACCORDANCE WITH 2021 IBC-NJ EDITION SECTION 713.4 SECT. THAT ANY HORIZONTAL AREA DOES NOT EXCEED 3,000 S.F.
2. WOOD CASING AT TRANSACTION WINDOW TO BE 1x PAINT GRADE POPLAR. WOOD STOPS TO BE PAINT GRADE POPLAR, SIZE AS REQUIRED.
3. AT BUILDING A, GENERAL CONTRACTOR TO SUPPLY AND INSTALL A 10 MIL. POLY VAPOR BARRIER BELOW CONC. FLOOR SLAB AT STORAGE #1, INCLUDING JAN. CLOSET, TOILET ROOM, VESTIBULE, OFFICE AND IT.
4. AT BUILDING B GENERAL CONTRACTOR TO SUPPLY AND INSTALL A 10 MIL. POLY VAPOR BARRIER BELOW CONC. FLOOR SLAB AT ENTIRETY OF BUILDING
5. G.C. TO PROVIDE AND INSTALL FIRE BLOCKING IN ALL INTERIOR AND EXTERIOR PARTITIONS IN ACCORDANCE WITH 2021 IBC-NJ EDITION SECTION 718
6. BOTTOM OF TRUSS BUILDING A: 14'-0" A.F.F. BOTTOM OF TRUSS BUILDING B: 16'-0" A.F.F.

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AI-07220
AI-07473
AI-13038
AI-13618

Project
**NEW POLE BARN FOR
CITY OF VINELAND
PUBLIC WORKS**
72 W. PARK AVE.
VINELAND, NJ 08360

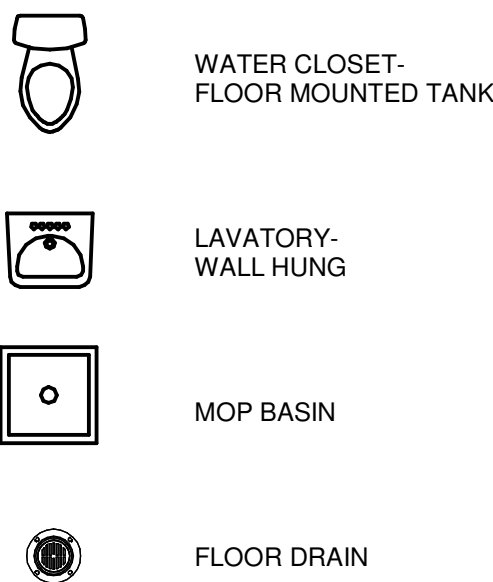
Drawing		
BUILDING SECTIONS & DETAILS		
Scale	Job	Sheet
AS NOTED	23.089	A3.0
Drawn	Date	
NDZ/CSM	10/08/24	5 of 5

SCHEDULE OF PLUMBING FIXTURES																					
MARK	FIXTURE LAVATORY	MANUFACTURER	MODEL NO.	FIXTURE WALL-HUNG A.D.A. HEIGHT	FIXTURE MATERIAL VITREOUS CHINA	FIXTURE STYLE 20" X 18" 3-HOLE	FAUCET / VALVE					SUPPLY MA' TYPE ZURN Z81016-XL-LR- 8860-12-PC	DRAIN			DOMESTIC CW 1/2"	DOMESTIC HW 1/2"	SANITARY WASTE 1 1/2"	SANITARY VENT 1 1/2"	REMARKS	
							MANUFACTURER	MODEL NO.	SPOUT	HANDLES	CENTERS		TRAP / ARM SIZE	TAILPIECE	OFFSET						
MB1	MOP BASIN	ZURN	Z1996-36-MH- WG	FLOOR-SET	HIGH DENSITY COMPOSITE BASIN	36"x24"x10"	ZURN	Z843M1-XL-CS -HCT-WHK-SH	3/4" HOSE SPOUT W/ VACUUM BREAKER	LEVERS	8"		STAINLESS STEEL STRAINER	3"		3/4"	3/4"	3"	1 1/2"	WITH 60" VINYL HOSE, HOSE BRACKET, VINYL BUMPER GUARD, 24"x24" WALL GUARDS, COMPLETE WITH PAIL HOOK AND WALL BRACE.	
WC1	WATER CLOSET	ZURN	Z5551-K	FLOOR MOUNT FLUSH TANK	VITREOUS CHINA	A.D.A. PRESSURE ASSIST ED SIPHON JET BURIED, SELF DRAINING				LEVER		ZURN Z81016-CR-887 0-12-PC				1/2"		4"	2"	1.6 GALLON FLUSH, ZURN Z5955SS-EL-AM-STS SEAT. TOILET FLANGE BOLTS SHALL BE DOUBLE NUTTED.	
YH1	YARD HYDRANT	ZURN	Z1396XL-AC	NON-FREEZE	CAST IRON W/ BRONZE/STAINLESS STEEL COMPONENTS					LOCKING LEVER						3/4"				ANTI-SIPHON, AUTOMATIC DRAINING, NON-FREEZE. PROVIDE WITH LOCK AND INCLUDE OPERATING KEY. ENSURE BURY DEPTH IS BELOW FROST LINE.	

SCHEDULE OF ELECTRIC WATER HEATERS											
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											
MARK	MANUFACTURER	MODEL No.	TANK CAPACITY (GALLONS)	RECOVERY RATE @ 100 °F TEMPERATURE RISE (GPH)	HOT WATER TEMP OUT	KW INPUT	ELECTRICAL			REMARKS	
DWH1	AO SMITH	DSE-20	20	25	140 °F	6	VOLTAGE	PHASE	FREQUENCY		
							208 V	3	60 Hz		

SCHEDULE OF DRAINS AND CLEANOUTS							
MARK	FIXTURE	MANUFACTURER	MODEL No.	TYPE	MATERIAL	STYLE	REMARKS
FCO	FLOOR CLEANOUT	ZURN	ZN1400-VP-BP	NO HUB OR NEO-LOCK	CAST IRON / NICKEL BRONZE TOP	SCORiated ROUND TOP	VANDAL RESISTANT SECURED TOP, PROVIDE NICKEL BRONZE TOP IN FINISHED AREAS, BRONZE TOP IN UNFINISHED.
FD1	FLOOR DRAIN	ZURN	Z-507	NO HUB- OR NEO-LOCK	CAST IRON / CAST IRON TOP	7" ROUND	PROVIDE 4" DEEP SEAL P-TRAP WITH CLEANOUT.

SCHEDULE OF TEMPERATURE MIXING VALVES							
MARK	MANUFACTURER	MODEL No.	SERVICE	FLOW RATE @ 20 PSI PRESSURE DROP	MINIMUM FLOW	FINISH	REMARKS
TMV1	LEONARD	LV-20-E-LF-T	HOT WATER	14 GPM	1 GPM	ROUGH BRONZE	INSTALL AND CONNECT PER MANUFACTURERS RECOMMENDATIONS. SET HOT WATER OUTPUT @120°F MAX. PROVIDE w/ 140°F HW & CW INLET SUPPLY STRAINERS.



PLUMBING LEGEND

ABBREVIATION

CW	DOMESTIC COLD WATER
DWH	DOMESTIC WATER HEATER
EX	EXISTING
FCO	FLOOR CLEANOUT
FD	FLOOR DRAIN
HB	HOSE BIBB
HW	DOMESTIC HOT WATER
L	LAVATORY
MB	MOP BASIN
RPBP	REDUCED PRESSURE BACKFLOW PREVENTER
TMV	THERMOSTATIC MIXING VALVE
V	SANITARY VENT
VTR	VENT THRU ROOF
W	SANITARY WASTE
WC	WATER CLOSET
YCO	YARD CLEANOUT
YH	YARD HYDRANT

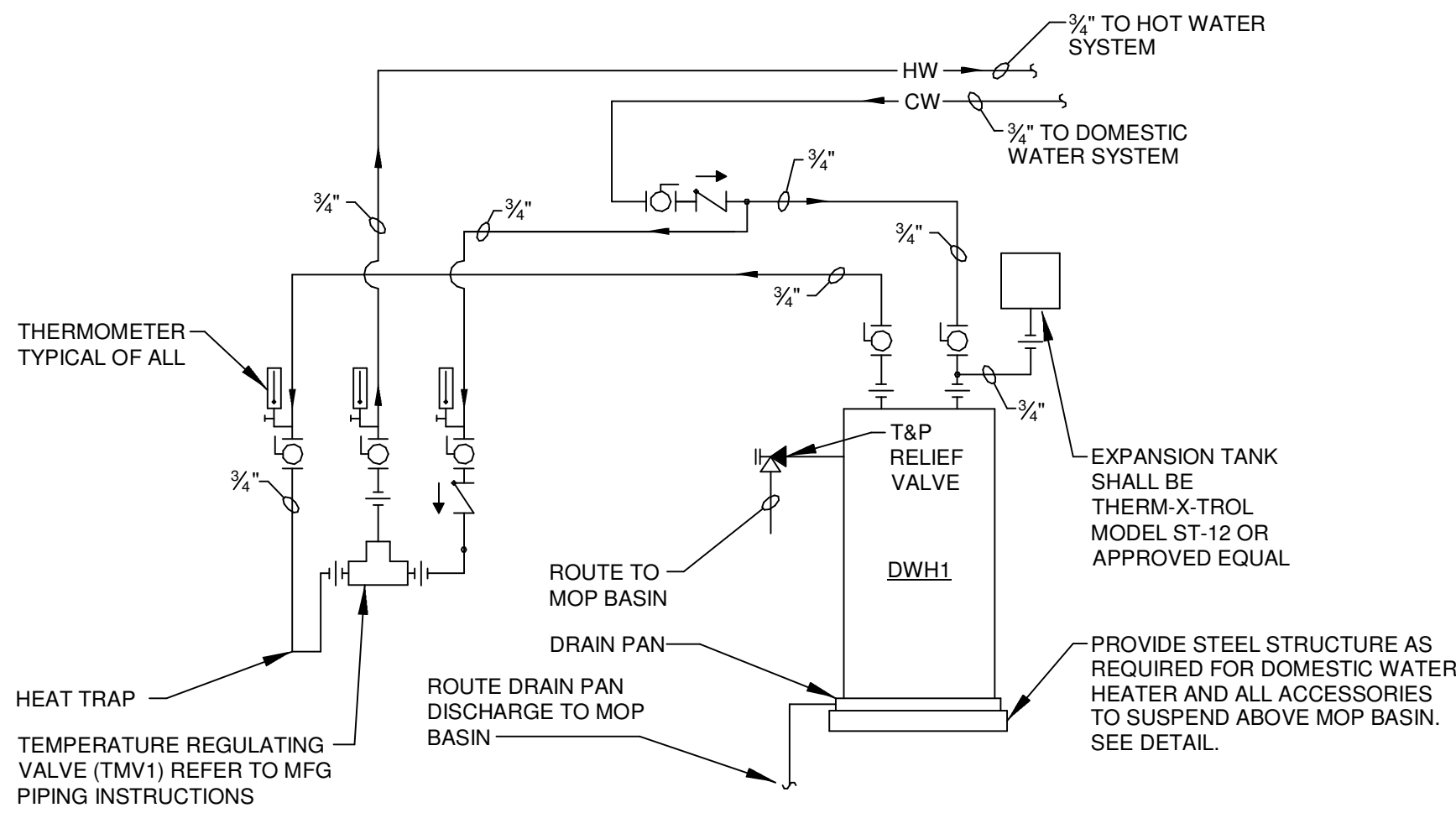
SYMBOLS

3D	2D

GENERAL NOTES:

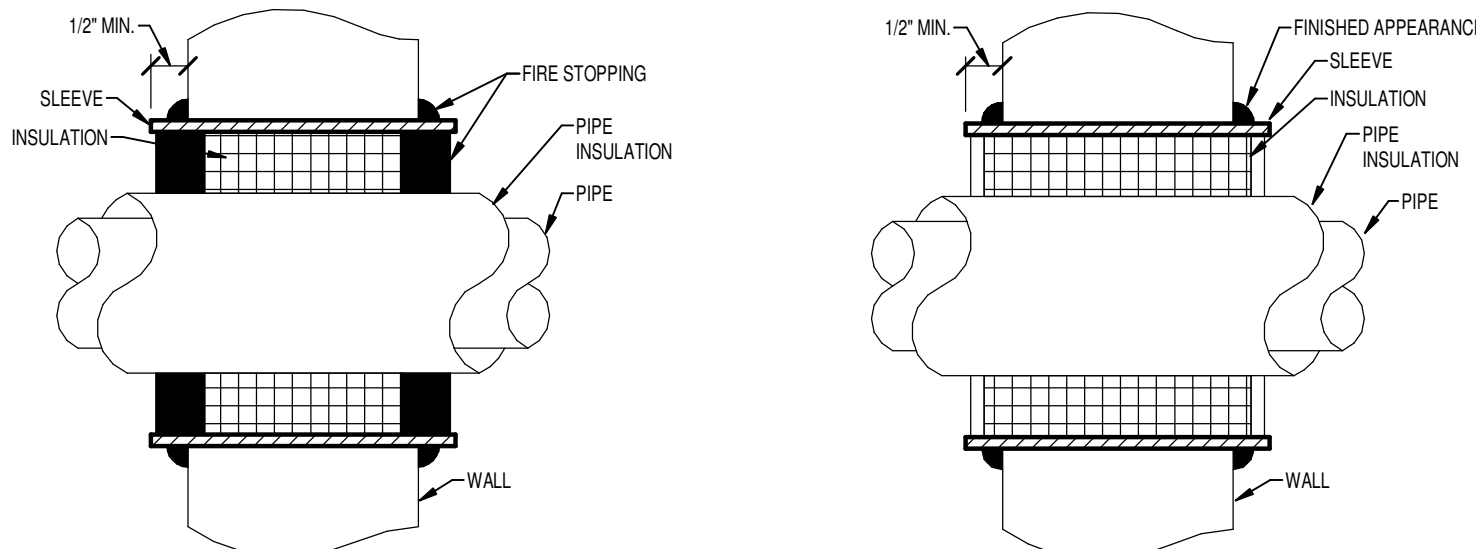
APPLIES TO ALL SHEETS

- CONDITIONS SHOWN ON THE PLANS RELATIVE TO THE WORK TO BE PERFORMED ARE BASED ON THE BEST INFORMATION AVAILABLE AND SUBJECT TO VERIFICATION. VERIFY LOCATIONS AND ELEVATIONS OF UTILITIES TO BE CROSSED OR CONNECTED. CORRECT DEFICIENCIES CAUSED BY FAILURE TO PERFORM SUCH VERIFICATIONS AT NO EXPENSE TO OWNER. IMMEDIATELY NOTIFY ARCHITECT AND ENGINEER OF CONDITION IN CONFLICT WITH THE DETAILS/PLANS.
- EXISTING INFORMATION SHOWN ON FLOOR PLANS IS FROM ORIGINAL RECORD DRAWINGS AND FIELD INVESTIGATION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL EXISTING CONDITIONS IN THE FIELD BEFORE COMMENCEMENT OF WORK. THE CONTRACTOR IS REQUIRED TO REPORT TO THE ARCHITECT DISCREPANCIES OR INCONSISTENCIES BETWEEN THE SPECIFIED DESIGN AND EXISTING CONDITIONS FOR CLARIFICATION PRIOR TO COMMENCEMENT OF THE WORK. ABSOLUTE ACCURACY OF THE DRAWINGS CANNOT BE GUARANTEED. WHILE EVERY EFFORT HAS BEEN MADE TO COORDINATE THE LOCATION OF EXISTING EQUIPMENT, PIPING, ETC. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE THE EXACT REQUIREMENTS GOVERNED BY ACTUAL JOB CONDITIONS.
- PLUMBING SYSTEMS SHALL BE DESIGNED AND INSTALLED PER LOCAL PLUMBING CODE.
- REPORT TO ARCHITECT IN WRITING, CONDITIONS WHICH WILL PREVENT PROPER PROVISION OF THIS WORK.
- THE DRAWINGS SHOWING THE LOCATIONS OF PLUMBING EQUIPMENT, PIPING, ETC. ARE DIAGRAMMATIC. CONTRACTOR SHALL PROVIDE ALL OFFSETS, ADJUSTMENTS ETC. JOB CONDITIONS MAY NOT PERMIT THEIR INSTALLATION AT THE LOCATIONS SHOWN. THE PLUMBING DRAWINGS SHOW THE GENERAL ARRANGEMENT OF EQUIPMENT, PIPING, DEVICES, ETC. & SHALL BE FOLLOWED AS CLOSE AS POSSIBLE.
- LOCATE VALVES FOR SERVICE ACCESSIBILITY. PROVIDE VALVE TAGS & PLASTIC LAMINATE IDENTIFICATION ON GELING FOR ALL NEW AND EXISTING VALVES AND EQUIPMENT LOCATED WITHIN THE CONSTRUCTION LIMITS AS INDICATED IN THE SPECIFICATIONS.
- SEAL ALL OPENINGS NEW & EXISTING AROUND PLUMBING & UTILITY LINES PENETRATING FIRE WALLS. REFER TO ARCHITECTURAL DRAWINGS FOR LOCATION OF FIRE WALLS & ARCHITECTURAL SPECS FOR MATERIAL & INSTALLATION.
- CONTRACTOR SHALL COORDINATE WITH ARCHITECT ALL CONSTRUCTION PHASING AS IT APPLIES TO DEMOLITION & NEW WORK.



1 DOMESTIC WATER HEATER PIPING DIAGRAM

SCALE: NONE



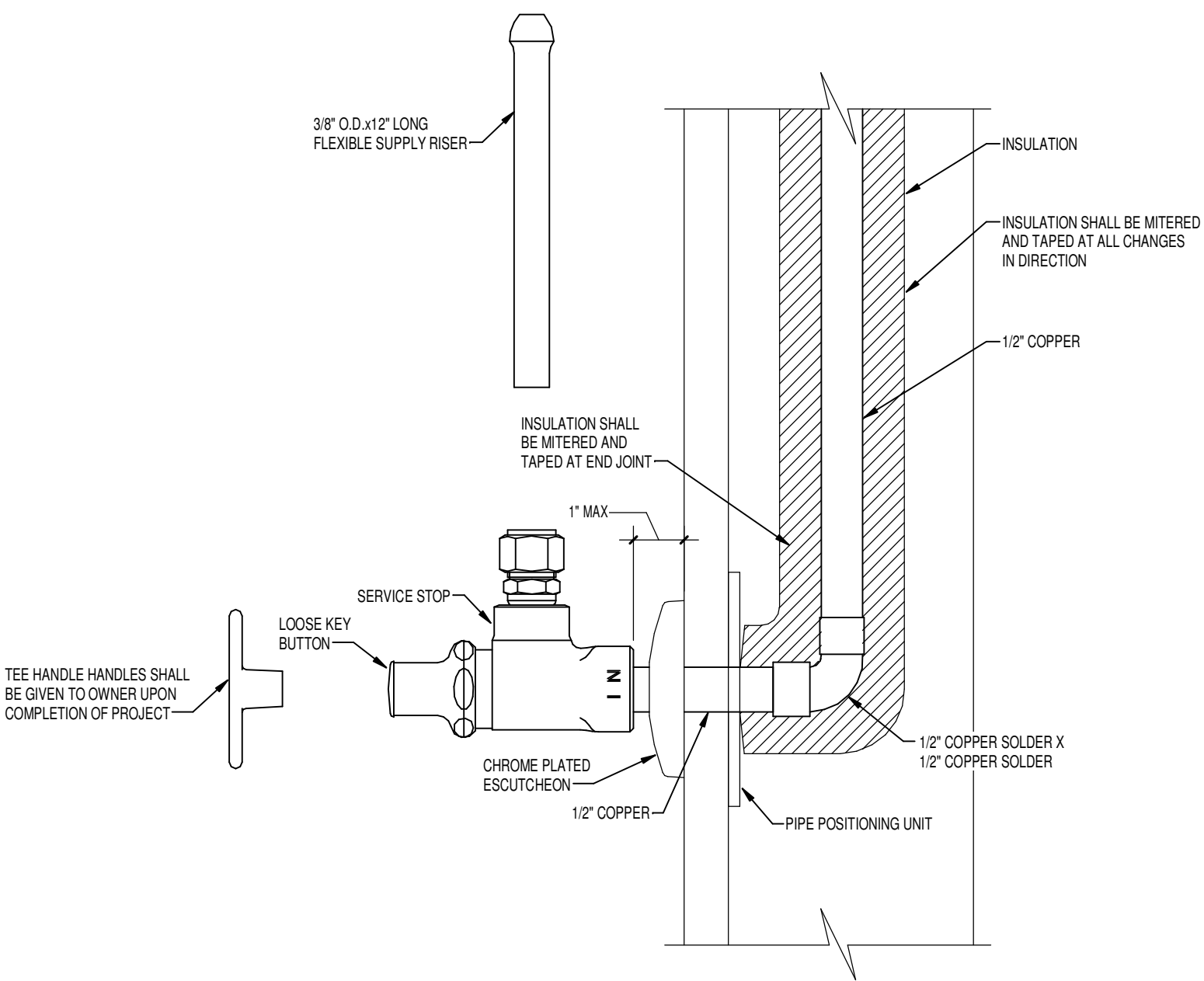
INTERIOR RATED WALL

INTERIOR NON RATED WALL

- NOTES:
1. INSTALL FIRE STOP PER MANUFACTURERS RECOMMENDATION.
2. REFER TO ARCHITECT SHEETS FOR LOCATIONS.

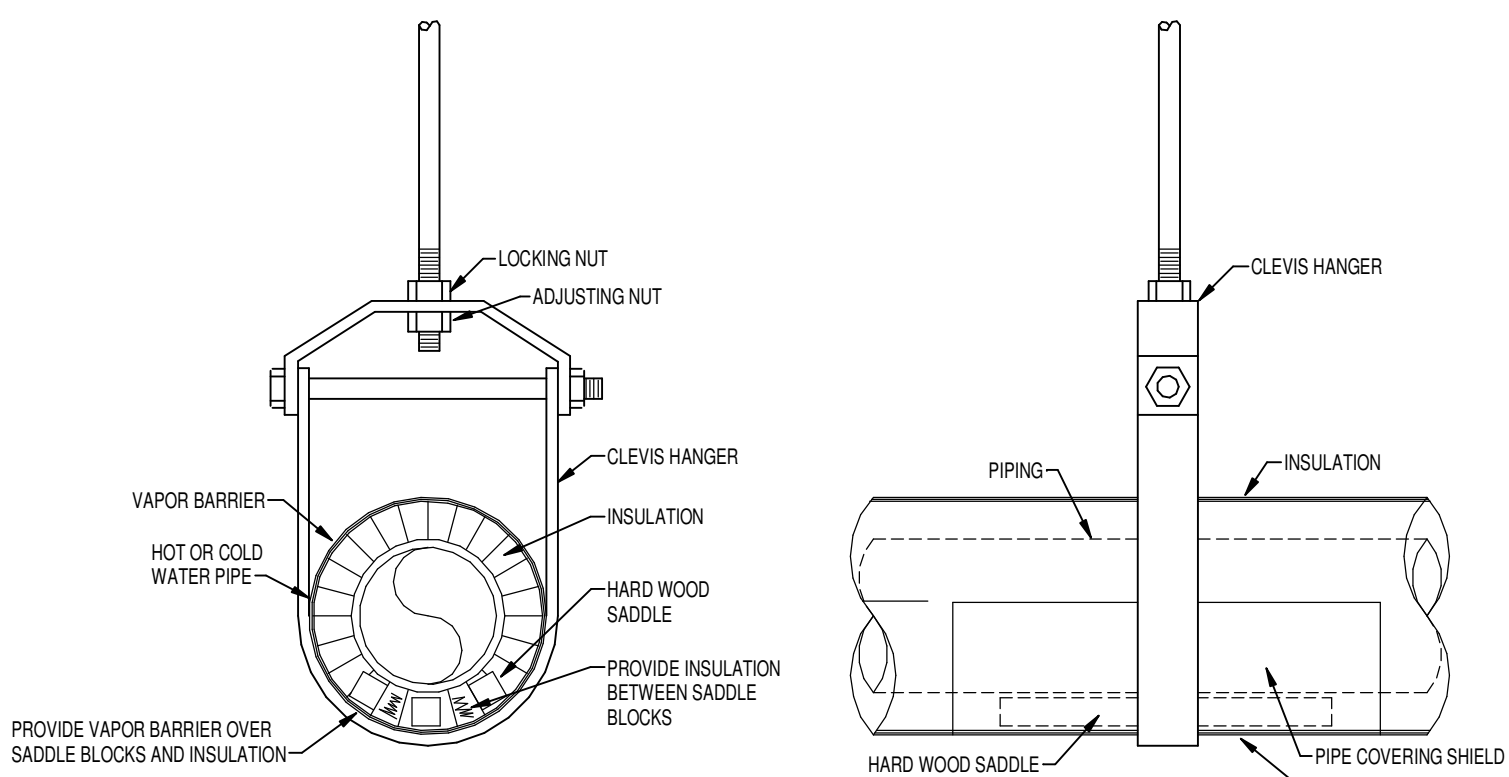
2 INTERIOR PIPE SLEEVE DETAIL

SCALE: NONE



3 TYPICAL SERVICE STOP INSTALLATION

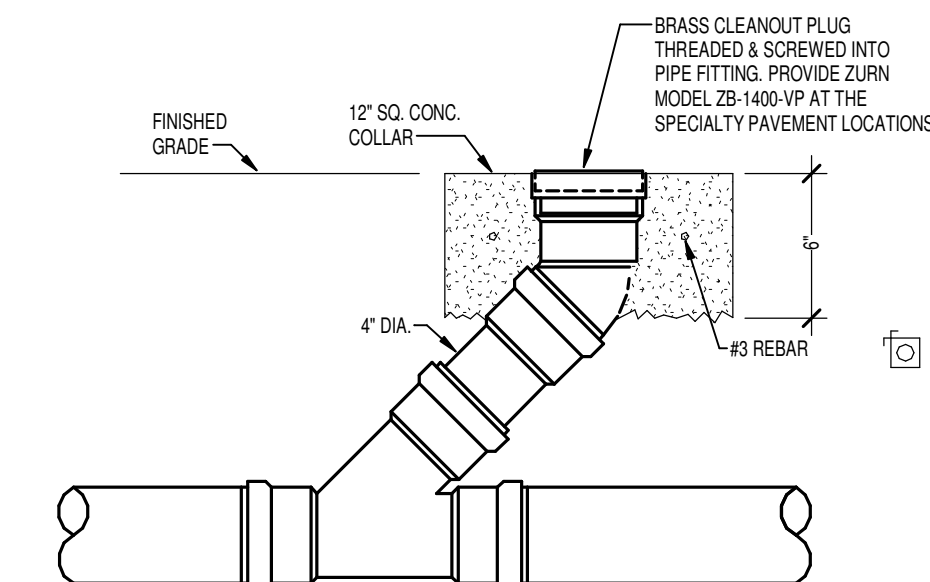
SCALE: NONE



- NOTES:
1. PROVIDE PIPE COVERING SHIELD AT EACH CLEVIS HANGER. INSTALL SHIELD BETWEEN BARRIER AND CLEVIS HANGER.
2. THIS DETAIL IS TYPICAL FOR ALL OTHER HANGERS AND SUPPORTS.

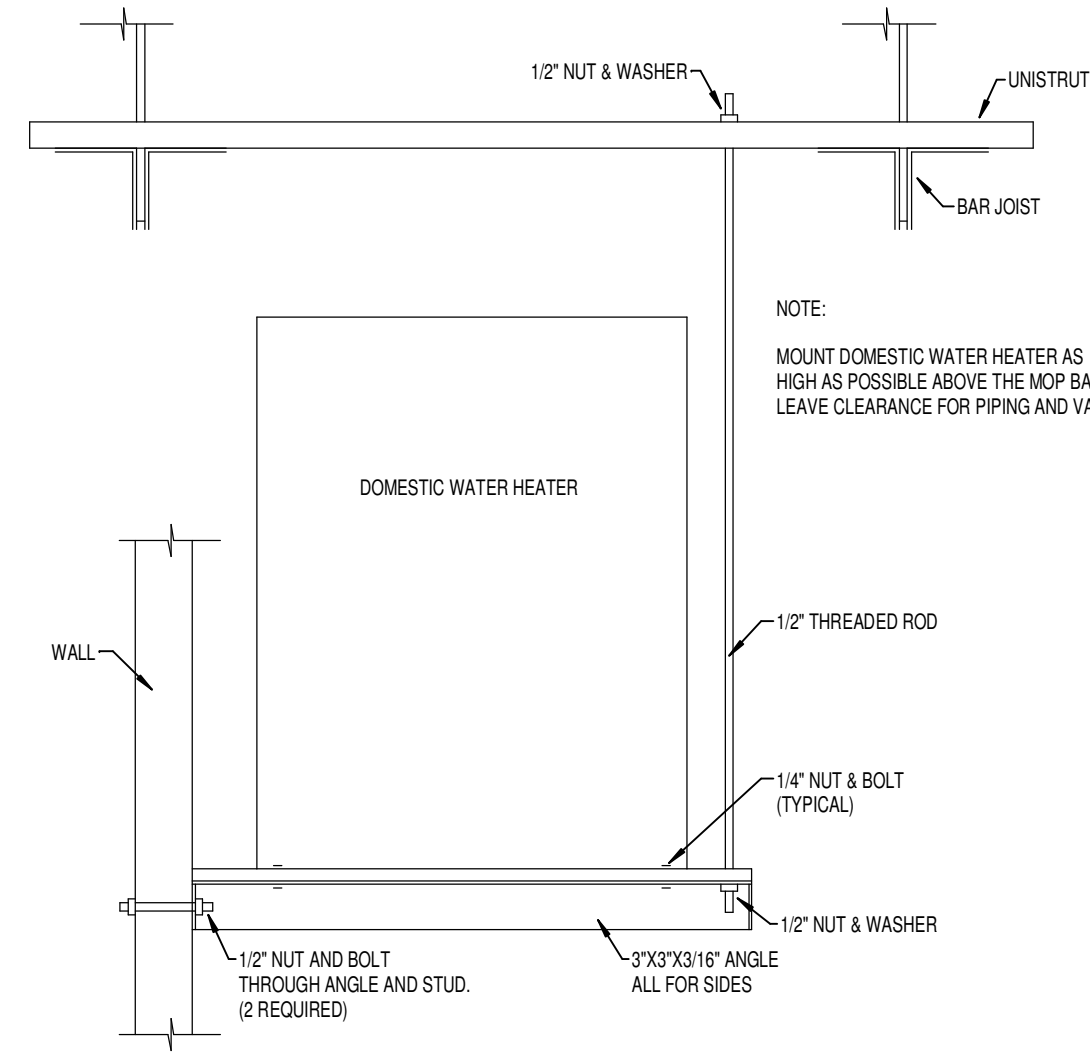
4 TYPICAL INSULATED PIPE HANGER DETAIL

SCALE: NONE



5 TYPICAL YARD CLEANOUT

SCALE: NONE



7 DOMESTIC WATER HEATER STAND

SCALE: NONE

RELEASE / REVISION

No.	Date	Description



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Project

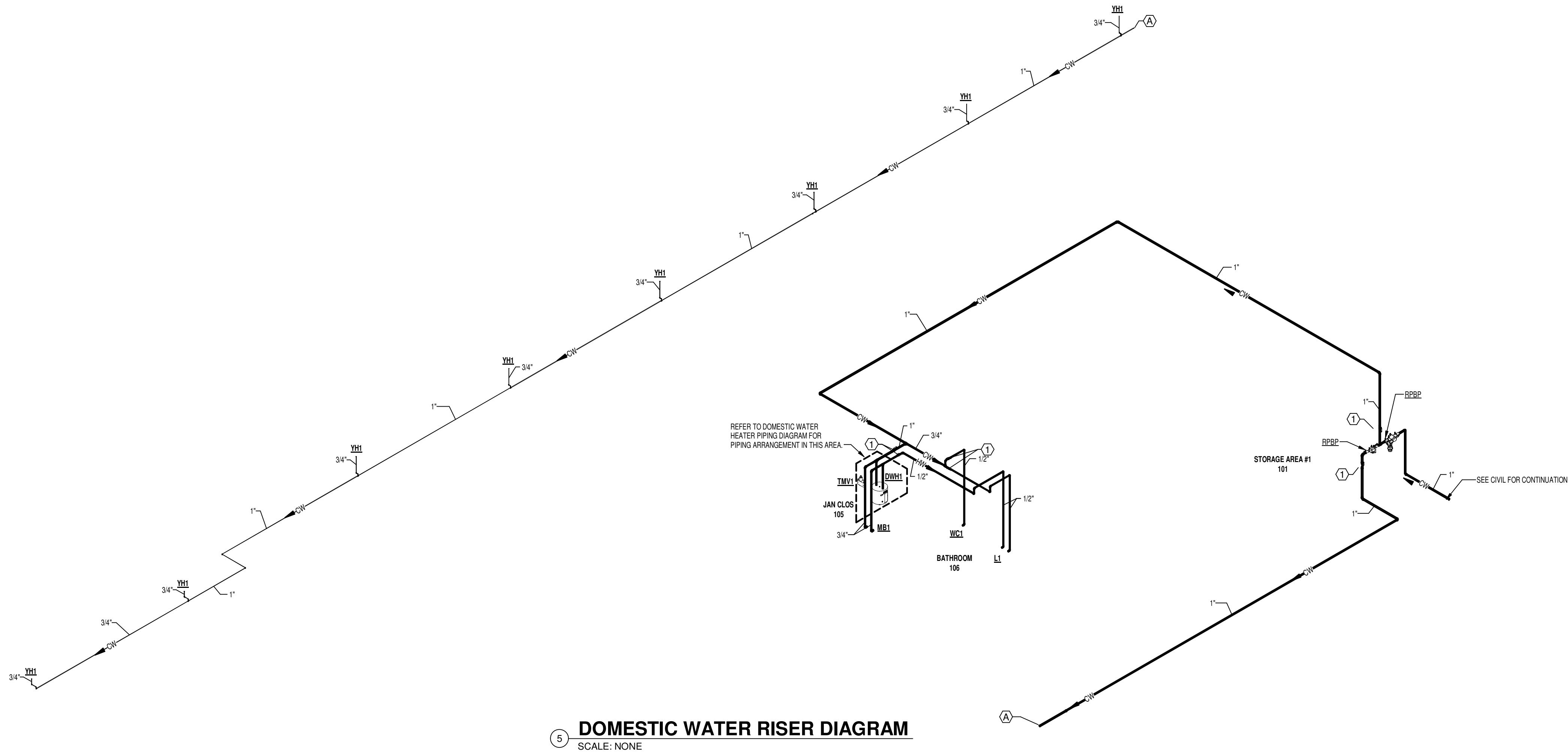
NEW POLE BARN FOR CITY OF VINELAND PUBLIC WORKS

Drawing

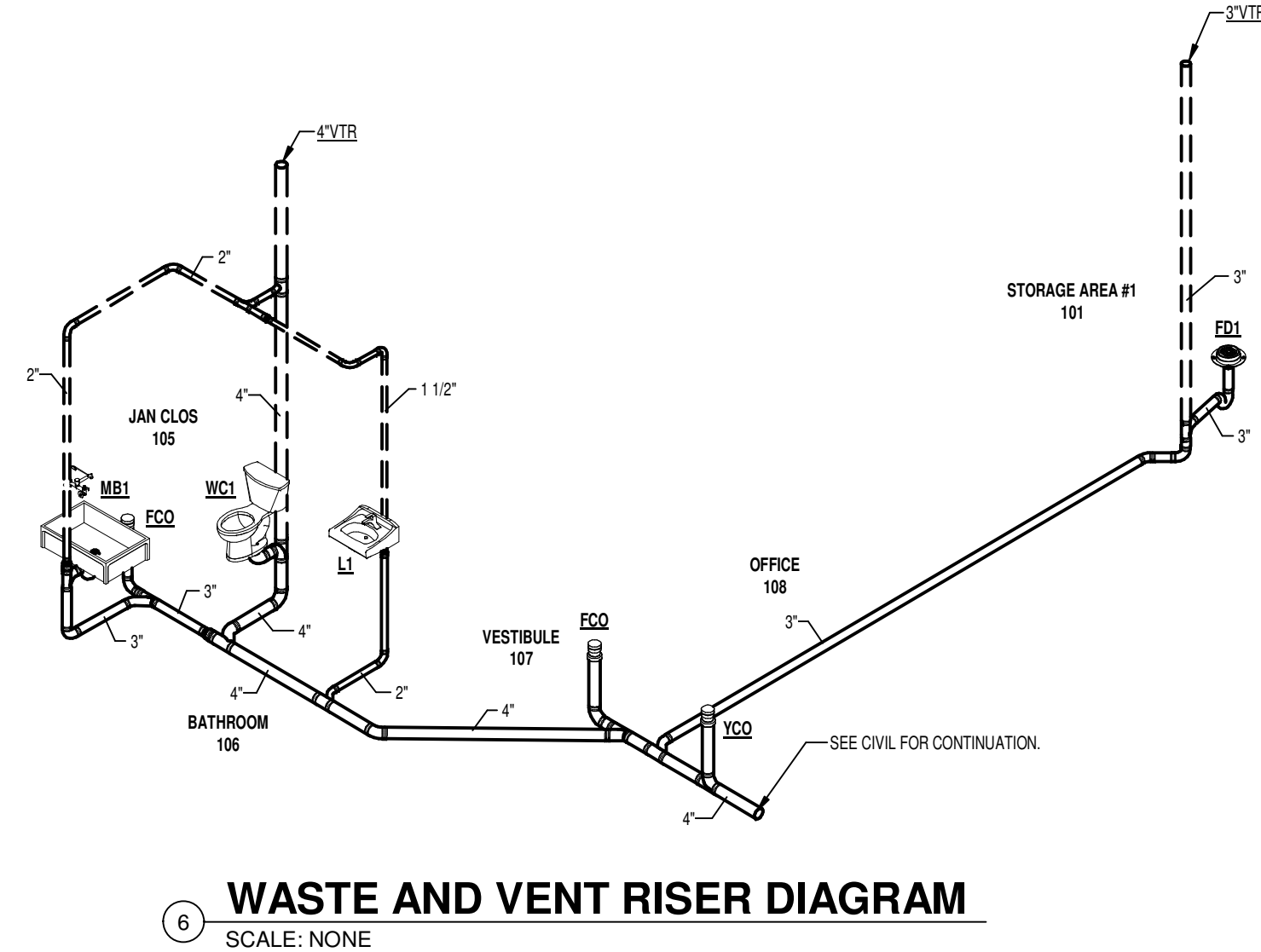
PLUMBING LEGEND AND SCHEDULES

Scale	Job	Sheet
As indicated	23.089	P0.1
Drawn	Date	
MRS	10/08/2024	

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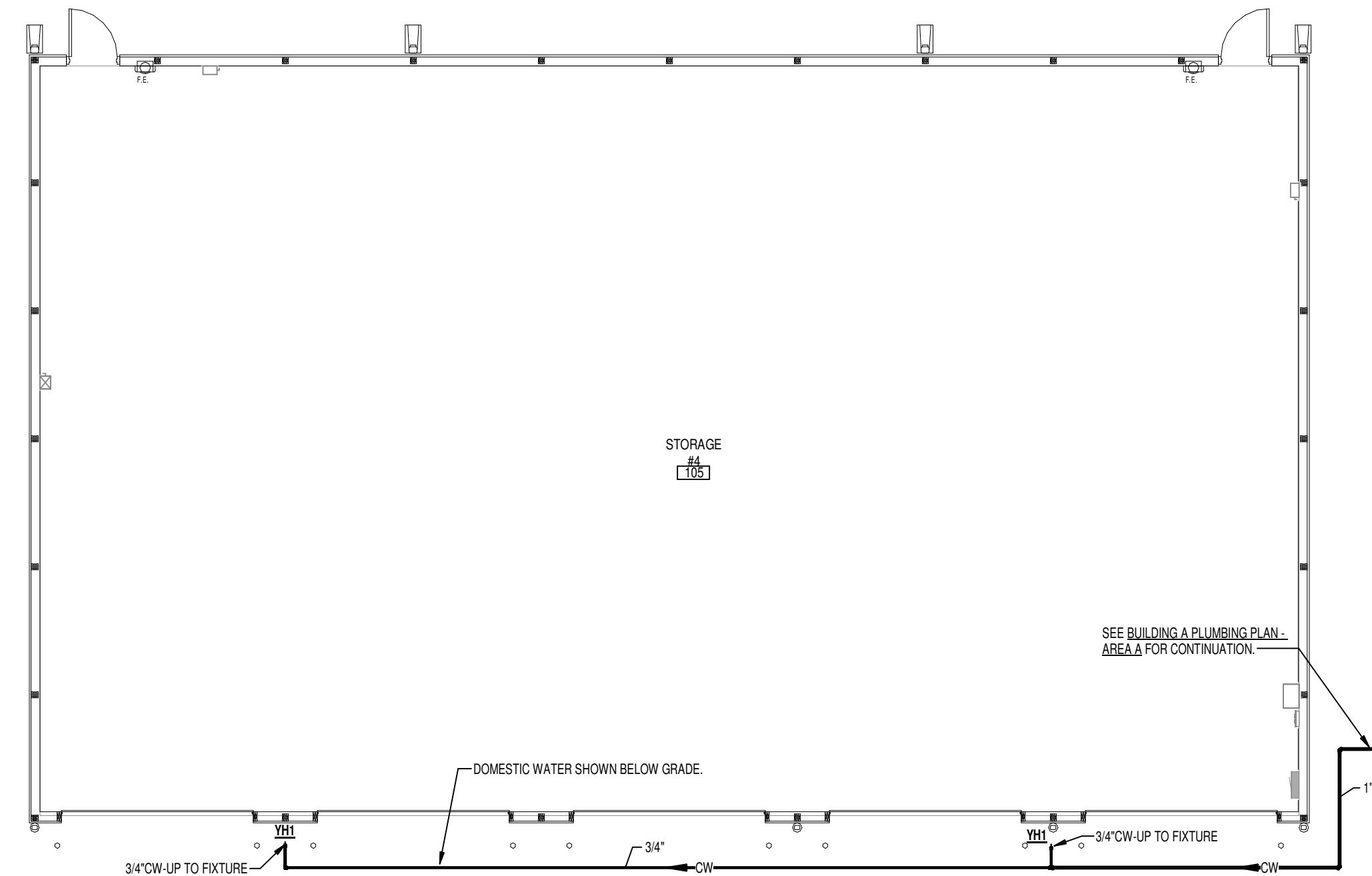


5 DOMESTIC WATER RISER DIAGRAM
SCALE: NONE

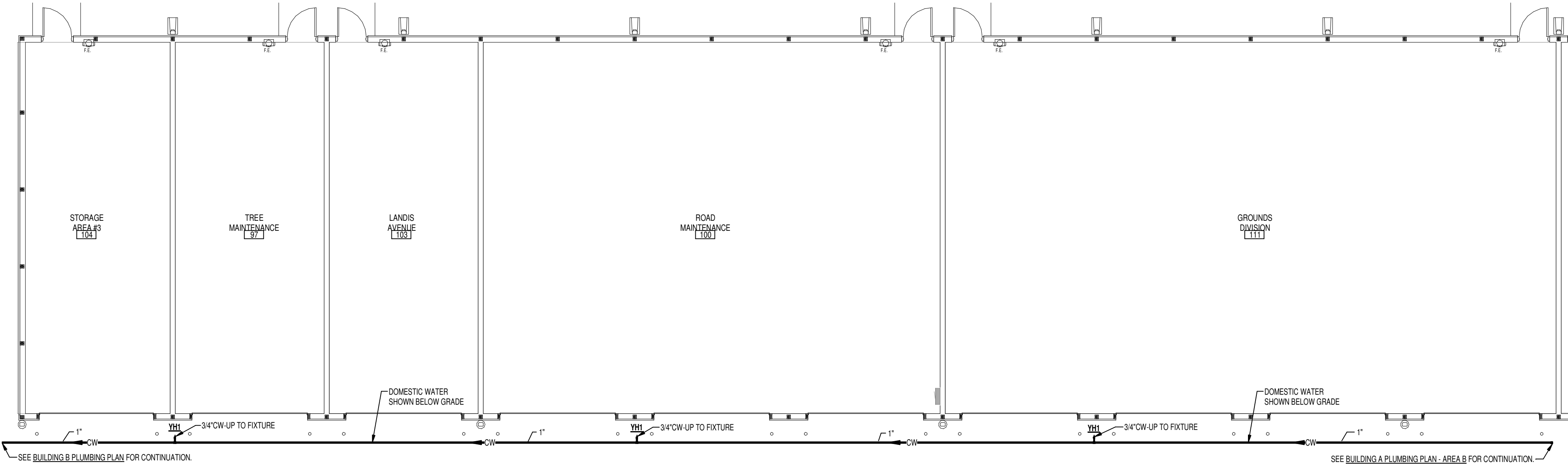


6 WASTE AND VENT RISER DIAGRAM
SCALE: NONE

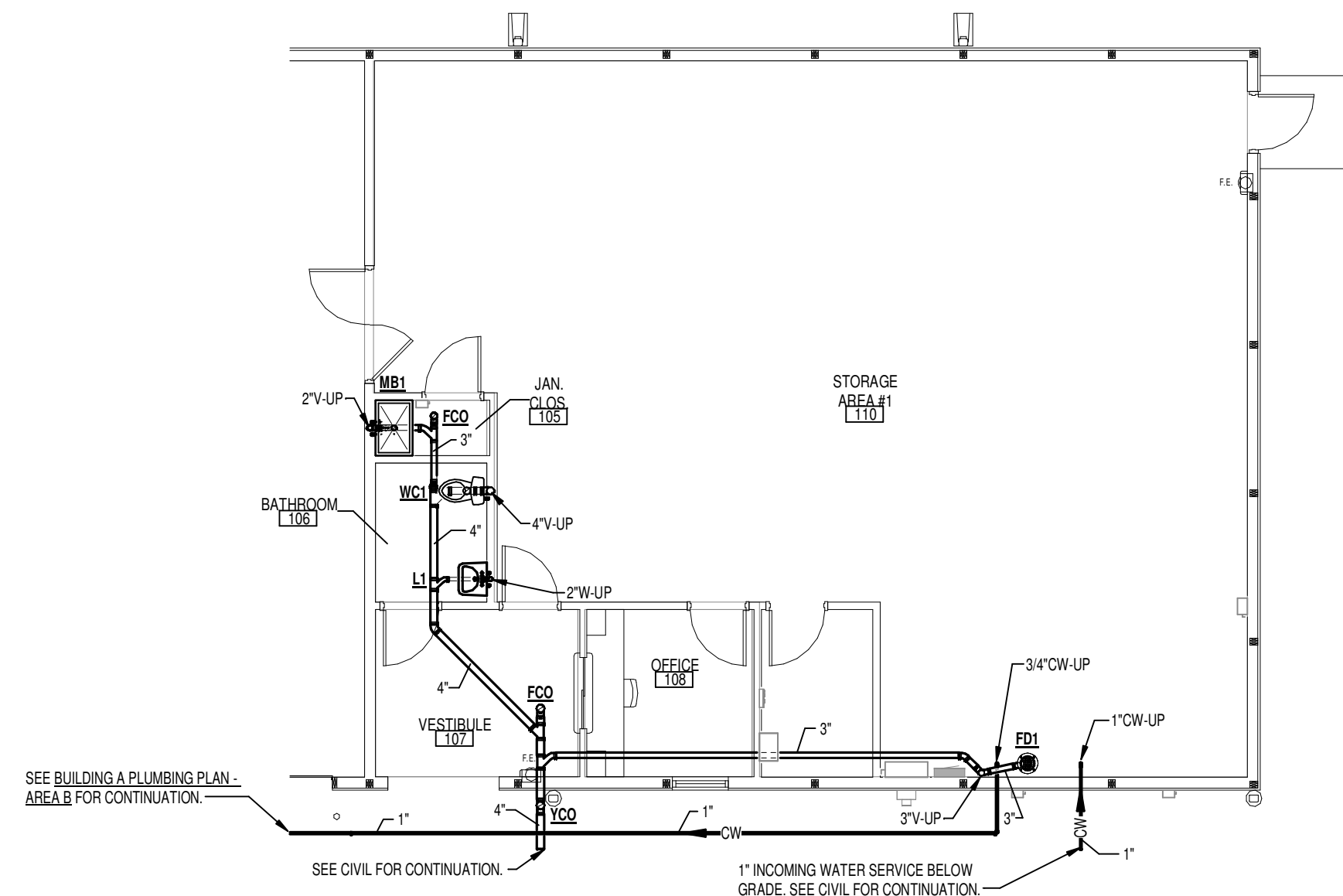
- KEYED NOTES:**
1. ISOLATION VALVE(S).
 2. 4" VENT, 1/2" COLD WATER DOWN TO FIXTURE.
 3. 1 1/2" VENT, 1/2" HOT AND COLD WATER DOWN TO FIXTURE.
 4. 2" VENT, 3/4" HOT AND COLD WATER DOWN TO FIXTURE.
 5. REFER TO DOMESTIC WATER HEATER PIPING DIAGRAM FOR PIPING ARRANGEMENT IN THIS AREA.



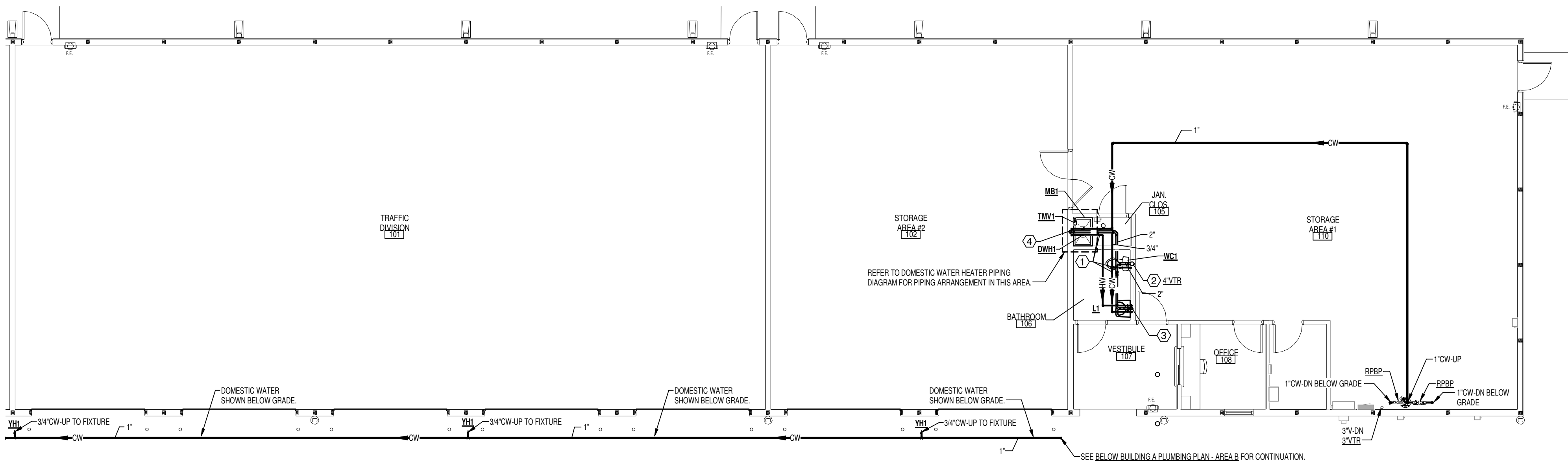
1 BUILDING B PLUMBING PLAN
SCALE: 1/8" = 1'-0"



2 BUILDING A PLUMBING PLAN - AREA A
SCALE: 1/8" = 1'-0"



3 BELOW BUILDING A PLUMBING PLAN - AREA B
SCALE: 1/8" = 1'-0"



4 BUILDING A PLUMBING PLAN - AREA B
SCALE: 1/8" = 1'-0"

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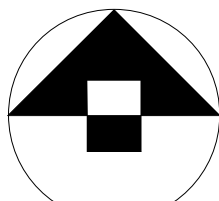
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Project

NEW POLE BARN FOR CITY
OF VINELAND PUBLIC
WORKS

Drawing

PLUMBING PLAN



Scale	Job	Sheet
As indicated	23.089	P1.0
Drawn	Date	
MRS	10/08/2024	

HVAC SYMBOLS AND ABBREVIATIONS LEGEND

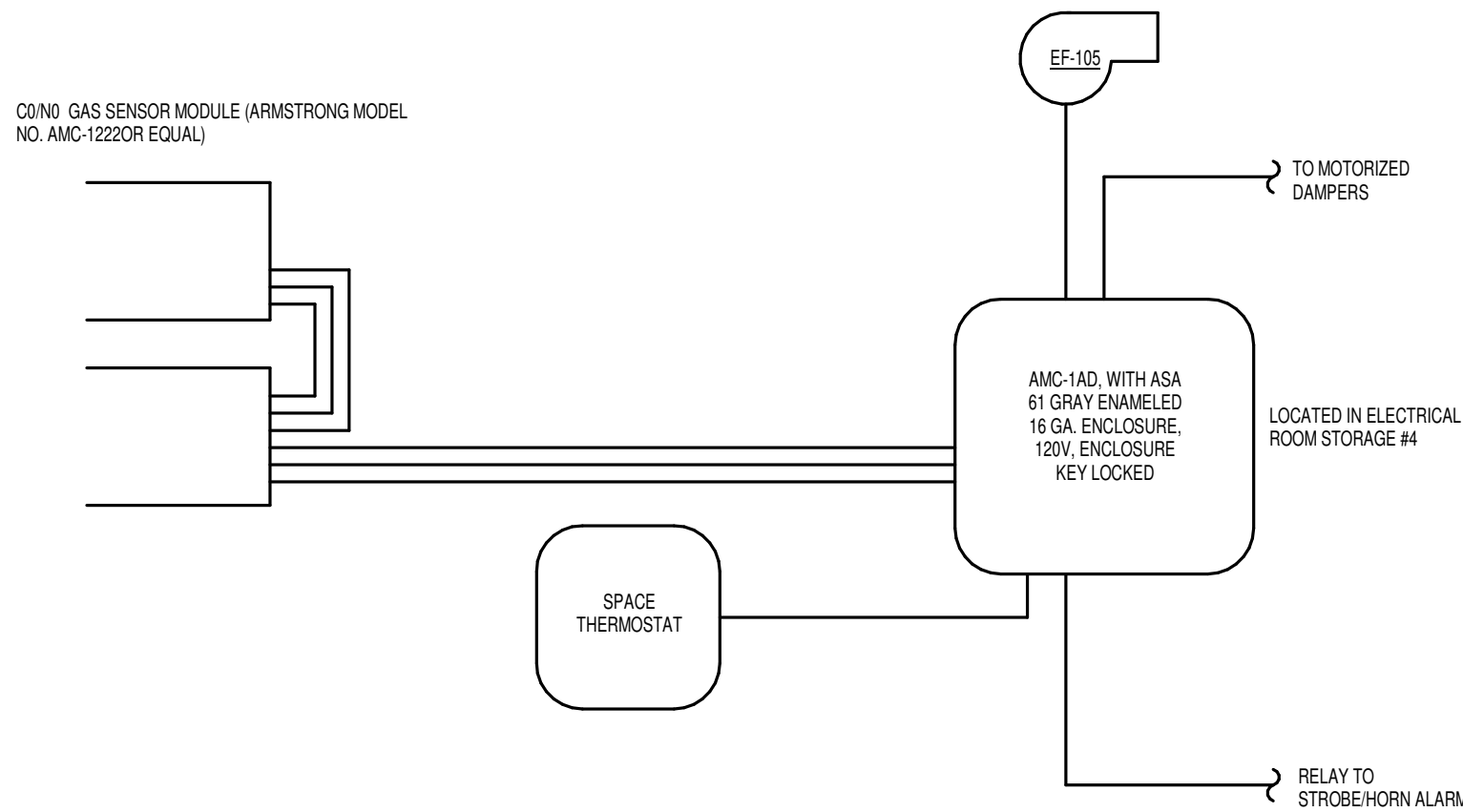
SYMBOLS			
3D	2D		
		ADJUSTABLE ROOM THERMOSTAT	E.A. EXHAUST AIR
		CARBON MONOXIDE SENSOR	CAP. CAPACITY
		BATHROOM EXHAUST FAN	PRESS. PRESSURE
		WALL EXHAUST FAN	TEMP. TEMPERATURE
		LOUVER	MIN. MINIMUM
		UNIT HEATER	MAX. MAXIMUM
		CABINET UNIT HEATER	AUTO. AUTOMATIC
		SPLIT SYSTEM AIR HANDLER	EX EXISTING
		HEAT PUMP	CONC. CONCRETE
			BTUH BTUIH
			A.F.F. ABOVE FINISHED FLOOR
			EF EXHAUST FAN
			CONN. CONNECTION
			HTR HEATER
			CLG. CEILING
			T.C. TEMPERATURE CONTROL
			MECH. MECHANICAL
			RM ROOM
			S.P. STATIC PRESSURE
			SHT. SHEET
			ASSOC. ASSOCIATED
			REF. REFERENCE
			UH UNIT HEATER

GENERAL NOTES:

- A. CONTRACTOR SHALL PROVIDE MANUFACTURER'S RECOMMENDED ACCESS TO ALL EQUIPMENT. ACCESS SHALL BE REMOVABLE CEILING TILES OR CEILING ACCESS PANELS. COORDINATE LOCATION OF MECHANICAL EQUIPMENT WITH OTHER TRADES TO AVOID CONFLICT.
- B. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN FOR LOCATION OF GRILLES AND DIFFUSERS.
- C. FOR ALL WALLS THAT ARE EXTENDED TO STRUCTURE PROVIDE SLEEVES FOR PIPING AND DUCTWORK PENETRATING WALLS (REFERENCE SPECIFICATIONS).
- D. DRAWINGS ARE DIAGRAMMATIC. PROVIDE ADDITIONAL OFFSETS, TRANSITIONS, ETC. AS REQUIRED TO AVOID INTERFERENCE'S ENCOUNTERED. FULL COORDINATION DRAWINGS WITH OTHER TRADES ARE REQUIRED.
- E. IF THE CONTRACTOR DOES NOT CLEARLY UNDERSTAND THESE PLANS OR IS NOT SURE OF THEIR MEANING, HE SHOULD OBTAIN THE ARCHITECTS WRITTEN EXPLANATION AND INTERPRETATION PRIOR TO SUBMITTING HIS BID. SINCE THE CONTRACTORS WILL BE HELD RIGIDLY TO THE INTERPRETATION OF THE ARCHITECT.
- F. CUT, PATCH, REPAIR AND RESTORE TO ORIGINAL CONDITION ALL OPENINGS IN WALLS, FLOORS, CEILINGS, ETC. WHERE REQUIRED. PATCHING SHALL MATCH EXISTING CONSTRUCTION & FINISHES. COORDINATE ALL PATCHING AND FINISHES WITH ARCHITECT.

Landis Sewerage Authority Locker Room: Required OA Calc.

Unit	Room #	Room Tag	Area	cfm/sqft	Occupant Density	OA cfm/person	Required OA	Unit OA cfm
DSS-1	108	Office	93	0.06	1.00	5	11	11
DSS-2		IT Room	53.1	0	0.00	0	0	0
CUH-105	105	Janitors Closet	26	0	0.00	0	0	0
CUH-106	106	Bathroom	48	0	1.00	0	0	0
CUH-107	107	Vestibule	102	0.06	0.00	0	6	6
UH-110	110	Storage Area #1	1627	0.06	0.00	0	98	98
UH-105A	105	Storage Area #4	3835	0.06	0.00	0	230	230



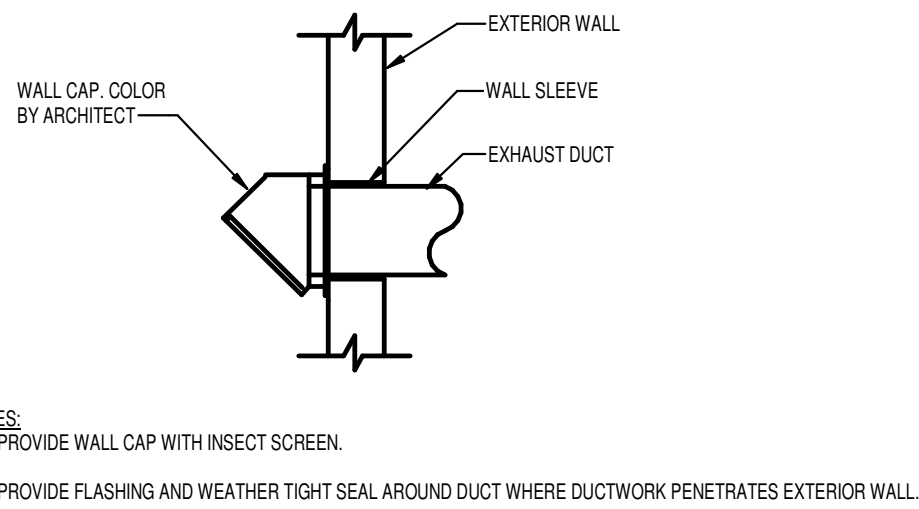
CARBON MONOXIDE GAS SENSOR MODULE
SCALE: NONE

- NOTES:
- PROVIDE ONE CO/NO. SENSOR FOR EACH 5,000 SQUARE FEET OF GARAGE SPACE AS INDICATED.
 - THE MONITORING STATION SHALL ACCEPT DIGITAL INPUTS FROM UP TO FOUR SENSORS TO PROVIDE ALARM STATUS INDICATION FOR EACH CHANNEL.
 - THE NORMALLY OPEN FAN RELAY CONTACTS ON THE MONITOR SHALL BE USED AS NORMALLY CLOSED MOTOR STARTERS, PILOT RELAY, OR CONTRACTOR.
 - WHEN ANY SENSOR DETECTS CO LEVELS ABOVE 25ppm OR IF A FAULT IS DETECTED, THE CORRESPONDING ALARM STATUS INDICATOR SHALL LIGHT, AND THE FAN RELAY DE-ENERGIZE, CAUSING THE CORRESPONDING FANS TO RUN PER SEQUENCE BELOW.
 - IF SPACE TEMPERATURE EXCEEDS 80°F (AQL) THE CORRESPONDING FANS SHALL RUN REGARDLESS OF THE CO MONITOR STATUS.
 - WHEN CO/NO. RETURNS TO SAFE LEVELS, AND TEMPERATURE DROPS BELOW SPACE SET POINT, EXHAUST FAN SHALL GO TO MINIMUM RUNNING STATUS.

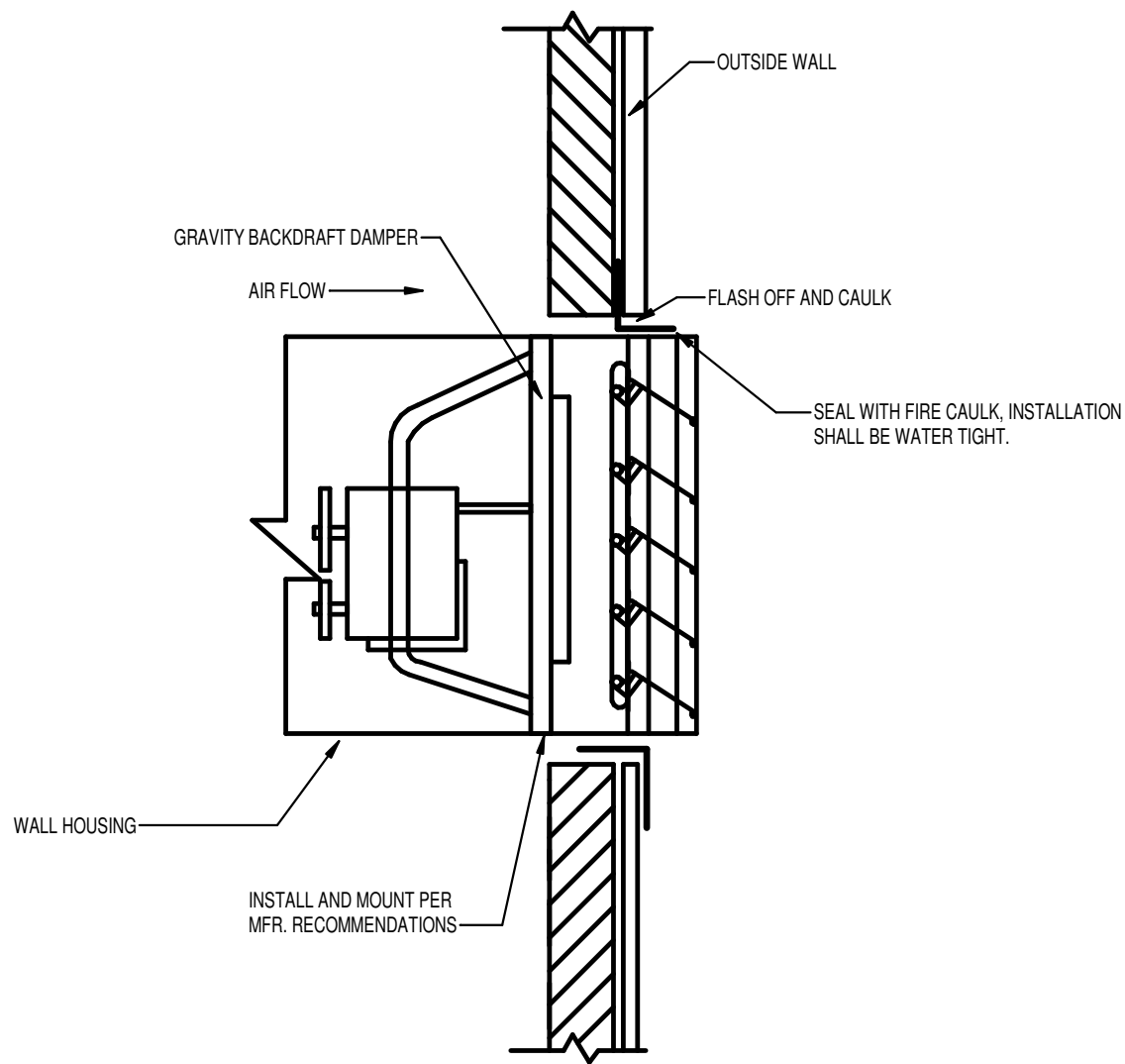
EF-105 STORAGE EXHAUST
FANS SEQUENCE OF OPERATION

- THRESHOLD #1: BELOW 25 PPM ONE (1) EXHAUST FAN SHALL RUN AT MINIMUM RPM TO BRING IN FRESH AIR AND MAINTAIN SATISFACTORY CO/NO. FAN STATUS SHALL BE MONITORED BY CURRENT SENSOR AND DIFFERENTIAL FLOW SWITCH.
- THRESHOLD #2: HIGH ALARM LEVEL TRIP AT 75 PPM THE CONTROLLER SHALL TURN ON HORN/SBUZZER AND ALARM LED LOCATED ON CONTROLLER OF HIGH PPM CO/NO. CONCENTRATIONS AND DIAL ALARM THROUGH MODEM TO DESIGNATED MAINTENANCE MONITORING PHONE NUMBER.
- INTERLOCK MOTOR OPERATED DAMPERS ON OUTDOOR AIR LOUVERS TO OPEN AT THRESHOLD #2.
- IF SPACE TEMPERATURE EXCEEDS 80°F (AQL) ONE (1) EXHAUST FAN SHALL RAMP UP PROPORTIONALLY TO HIGH SPEED. SECOND FAN SHALL CONTINUE IN STAND-BY MODE.

1 PARKING GARAGE EXHAUST FAN SEQUENCE OF OPERATION
SCALE: NONE

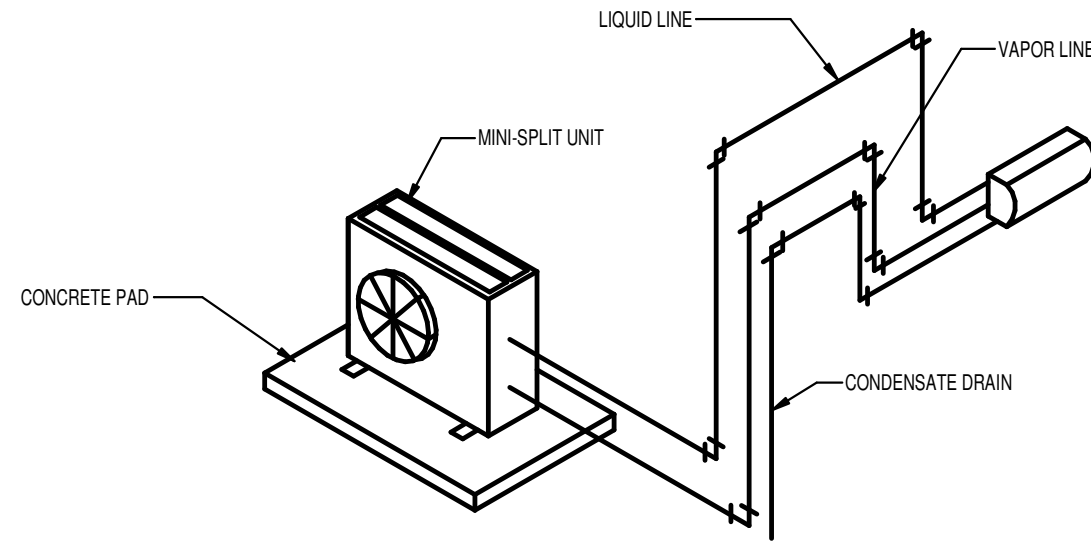


2 SIDEWALL EXHAUST DETAIL
SCALE: NONE



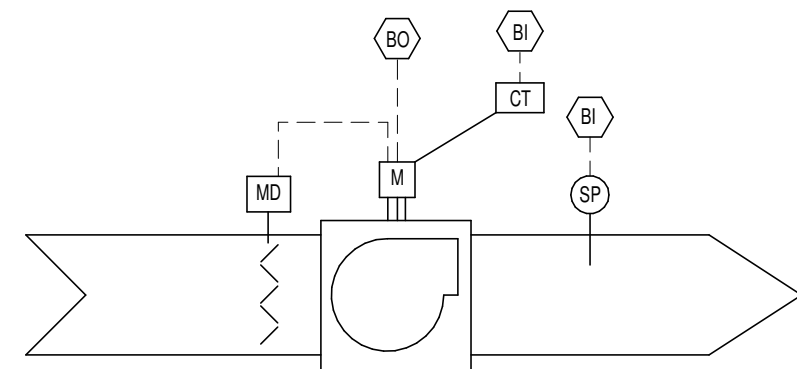
- NOTES:
- CONTRACTOR SHALL COORDINATE DIMENSION WITH ARCHITECT AND FRAMING CONTRACTOR.
 - CONTRACTOR SHALL COORDINATE ALL CODE AND MANUFACTURER CLEARANCES BEFORE INSTALLATION.

3 EXHAUST FAN DETAIL (SIDEWALL)
SCALE: NONE



- NOTES:
- SEE MANUFACTURER'S PIPING DIAGRAM FOR SIZING, CHARGING AND LONG LINE SET REQUIREMENTS.
 - SEE MANUFACTURER'S INSTALLATION MANUAL FOR TORQUE REQUIREMENTS ON LIQUID AND VAPOR PIPE FLARE FITTINGS.
 - PVC SLEEVES AT ALL WALL, FLOOR AND CEILING PENETRATIONS.
 - SEE PLAN FOR CONDENSATE ROUTING.
 - ANCHOR OUTSIDE UNIT TO CONCRETE PAD.

4 MINISPLIT/HEAT PUMP PIPING (PAD)
SCALE: NONE



EXHAUST FANS CONTROL DIAGRAM
SCALE: NONE

EXHAUST FANS
SEQUENCE OF OPERATION

REF: FAN SHALL RUN WHEN BATHROOM LIGHTS ARE ON.

5 EXHAUST FAN CONTROLS
SCALE: NONE

NOTE:
MECHANICAL (HVAC) DRAWINGS

This work will be performed by the owner.
Successful contractor will need to coordinate their work with the owner's workforce.
This information is supplied for information only.

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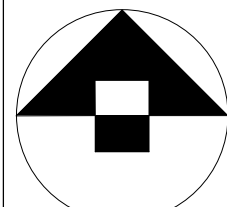
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Lawrence J. Merighi AIA AI-07473
Ronald P. Portadin AIA AI-13058
Peter W. Farrell AIA AI-13618

Project

NEW POLE BARN FOR CITY
OF VINELAND PUBLIC
WORKS

Drawing

HVAC GENERAL NOTES,
DETAIL & LEGEND



Scale

As indicated

Job

23.089

Sheet

M0.1

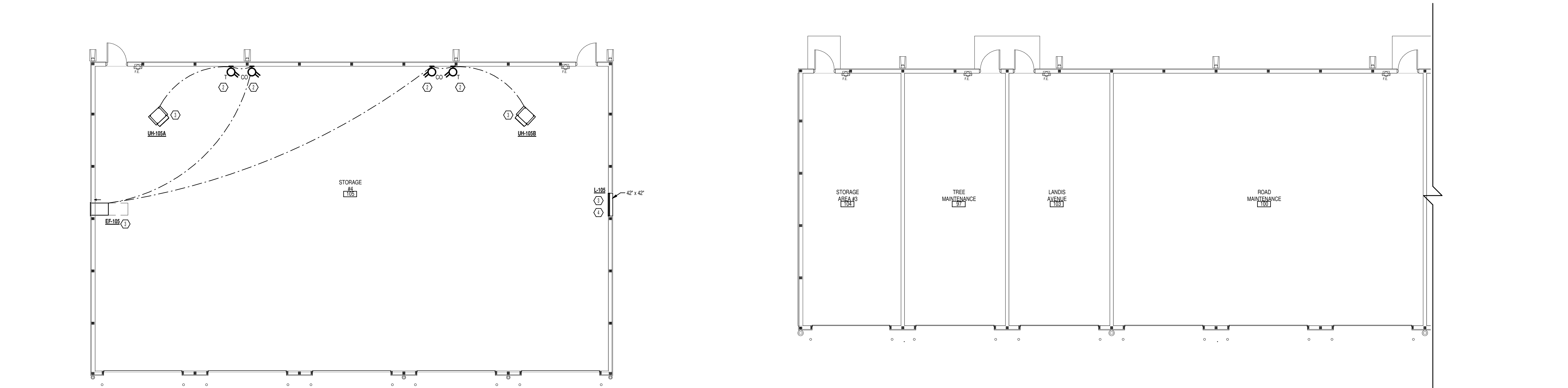
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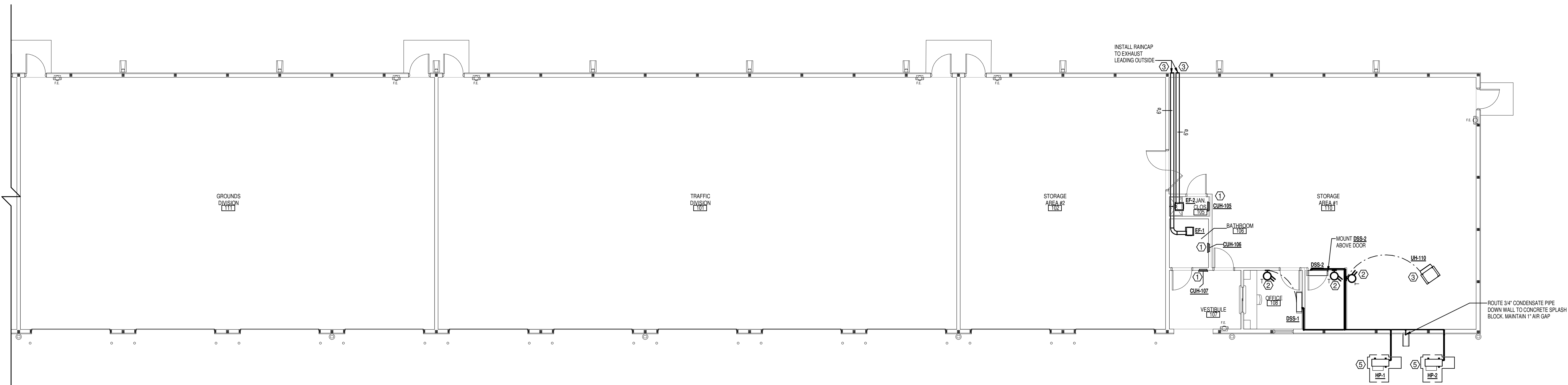
Date

10/08/2024

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1 HVAC DUCTWORK PLAN BCCLT - AREA A
SCALE: NONE



2 HVAC DUCTWORK PLAN BCCLT - AREA B
SCALE: 1/8" = 1'-0"

NOTE:
MECHANICAL (HVAC) DRAWINGS

This work will be performed by the owner.
Successful contractor will need to coordinate
their work with the owner's workforce.
This information is supplied for information only.

- KEYED NOTES:**
1. MOUNT CABINET HEATER 18" A.F.F. RECESSED INTO WALL.
 2. MOUNT THERMOSTAT OR SENSOR 4' A.F.F.
 3. MOUNT MOTORIZED DAMPER, EXHAUST FAN, OR CEILING HEATER 11' A.F.F.
 4. PLACE BIRDSCREEN ON PLENUM FOR LOUVER.
 5. INSTALL ON 4" CONCRETE PAD, BOLT IN PLACE WITH (4) 3/8" LAG BOLTS, USING LARGE METAL WASHERS.

RELEASE / REVISION		
No.	Date	Description



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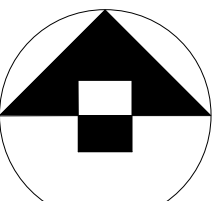
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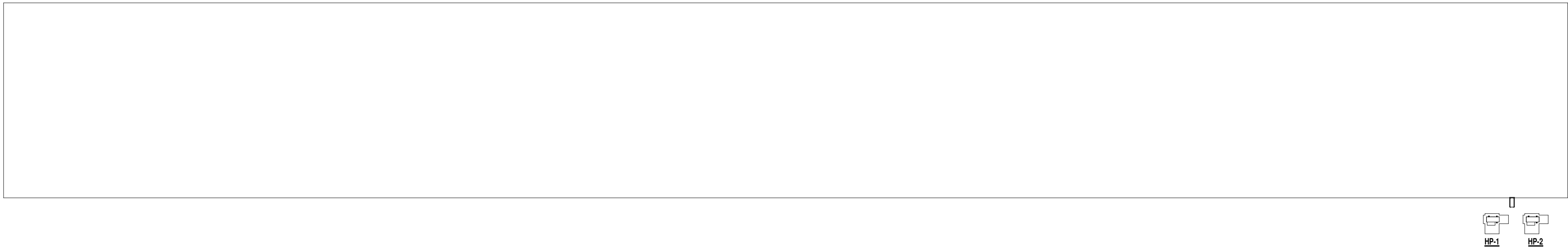
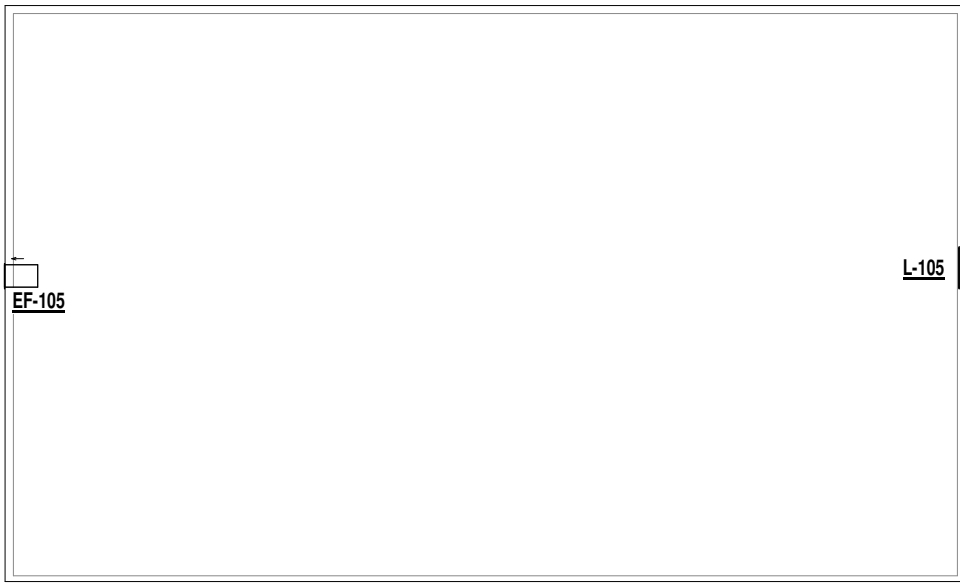
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Project

**NEW POLE BARN FOR CITY
OF VINELAND PUBLIC
WORKS**

Drawing		
HVAC DUCTWORK PLAN		
Scale 1/8" = 1'-0"	Job 23.089	Sheet M1.0
Drawn JJW	Date 10/08/2024	





2 HVAC ROOF PLAN
SCALE: 1/16" = 1'-0"

SCHEDULE OF MINI SPLIT SYSTEMS										
NOTES: 1. PROVIDE WITH REMOTE MOUNTED LCD DISPLAY WITH TEMPERATURE SETTING AND FAN SPEED CONTROL. 2. PROVIDE UNIT WITH CONDENSATE PUMP. 3. CONTRACTOR SHALL PIPE UNITS PER MANUFACTURER RECOMMENDATIONS. 4. VALUES LISTED CORRESPOND TO HIGH SETTING OF THE UNIT. 5. SHOP DRAWINGS MUST INCLUDE PERFORMANCE DATA OR THEY WILL BE REJECTED.										
MARK	MANUFACTURER	MODEL No.	TOTAL COOLING CAPACITY TOTAL	HEATING CAPACITY	CFM	SPL (dBA)	ELECTRICAL CHARACTERISTICS			NOTES
							VOLTAGE	PHASE	MCA	
DSS-1	MITSUBISHI ELECTRIC	NTXWST12B112AA	12000.0 Btu/h	14400 Btu/h	276	43	208	1	1 A	ALL
DSS-2	MITSUBISHI ELECTRIC	NTXWST12B112AA	12000.0 Btu/h	14400 Btu/h	276	43	208	1	1 A	ALL

SCHEDULE OF ELECTRIC CABINET HEATER									
NOTES: 1. COLOR AS SELECTED BY ARCHITECT FROM MANUFACTURER STANDARD COLORS. 2. CONTRACTOR TO FIELD VERIFY LENGTH OF MOUNTING WALL WITH SHOP DRAWING SUBMITTAL. 3. PROVIDE WITH DISCONNECT SWITCH, THERMOSTAT, RELAYS, AND ALL ACCESSORIES FOR SINGLE POINT OF ELECTRIC CONNECTION UTILIZATION. 4. PROVIDE WITH SEMI-RECESSED MOUNTING SLEEVE. 5. SHOP DRAWINGS MUST INCLUDE PERFORMANCE DATA OR THEY WILL BE REJECTED.									
MARK	MANUFACTURER	MODEL No.	SIZE	HEATING CAPACITY	WATTS	ELECTRICAL CHARACTERISTICS		MOUNTING	NOTES
						VOLTAGE	PHASE		
CUH-105	QMARK	CWH1101DSF	14AWG	3413.0 Btu/h	1000 W	120	1	WALL	ALL
CUH-106	QMARK	CWH1101DSF	14AWG	3413.0 Btu/h	1000 W	120	1	WALL	ALL
CUH-107	QMARK	CWH1101DSF	14AWG	3413.0 Btu/h	1000 W	120	1	WALL	ALL

SCHEDULE OF EXHAUST FANS												
NOTES: 1. PROVIDE WITH BACKDRAFT DAMPER AND DISCONNECT. 2. SHOP DRAWINGS MUST INCLUDE PERFORMANCE DATA OR THEY WILL BE REJECTED. 3. FAN OPERATES WITH LIGHTSWITCH. 4. FAN OPERATES WITH CO2 SENSOR												
MARK	AREA SERVED	MANUFACTURER	MODEL No.	SIZE	HP	FRPM	CFM	STATIC PRESSURE	ELECTRICAL CHARACTERISTICS		FAN MOUNTING	NOTES
									VOLTAGE	PHASE		
EF-1	BATHROOM	GREENHECK	SP	870	16 WATTS	675	71	0.13 in-wg	115	1	CEILING	1,2,3
EF-2	JANITORS CLOSET	GREENHECK	SP	870	16 WATTS	675	71	0.13 in-wg	115	1	CEILING	1,2,3
EF-105	STORAGE #4	GREENHECK	SE1-16	428 VG	3/4	1716	3000	0.25 in-wg	115	1	WALL	1,2,4

BUILDING VENTILATION CHART													
NAME	AREA (SF)	OCCUPANT DENSITY	OA CFM/PERSON	PERSON OA ROOMT	CFM/SQFT	SPACE OA ROOMT (CFM)	TOTAL OA ROOMT (CFM)	OA PROVIDED		NATURAL OA (SQFT)	NATURAL OA %	UNIT SERVING AREA	
Storage Area # 4	3835	0	N/A	0	0.06	230.1	230.1	NATURAL VENTILATION (BAY DOORS: IMC 402.1)		840	21.9	UH-105A, UH-105B, EF-105	
TREE MAINTENANCE	597	0	N/A	0	0.06	35.82	35.82	NATURAL VENTILATION (BAY DOORS: IMC 402.1)		168	28.14	N/A	
ROAD MAINTENANCE	1833	0	N/A	0	0.06	109.98	109.98	NATURAL VENTILATION (BAY DOORS: IMC 402.1)		504	27.49	N/A	
TRAFFIC DIVISION	3065	0	N/A	0	0.06	183.9	183.9	NATURAL VENTILATION (BAY DOORS: IMC 402.1)		840	27.40	N/A	
STORAGE AREA #2	1213	0	N/A	0	0.06	72.78	72.78	NATURAL VENTILATION (BAY DOORS: IMC 402.1)		336	27.69	N/A	
LANDIS AVENUE	597	0	N/A	0	0.06	35.82	35.82	NATURAL VENTILATION (BAY DOORS: IMC 402.1)		168	28.14	N/A	
STORAGE AREA #3	612	0	N/A	0	0.06	36.72	36.72	NATURAL VENTILATION (BAY DOORS: IMC 402.1)		168	27.45	N/A	
JAN. CLOS.	18	0	N/A	0	0.06	1.08	1.08	EX-HUAIST		N/A	N/A	EF-2	
BATHROOM	48	1	N/A	0	N/A	N/A	N/A	EX-HUAIST		N/A	N/A	EF-1	
VESTIBULE	102	0	N/A	0	0.06	6.12	6.12	NATURAL VENTILATION (ADJOINING SPACES: IMC 402.3)		42	41.17	CUH-107	
OFFICE	93	1	5	5	0.06	5.58	10.58	NATURAL VENTILATION (ADJOINING SPACES: IMC 402.3)		42	45.16	DSS-1	
STORAGE AREA #1	1627	0	N/A	0	0.06	97.62	97.62	NATURAL VENTILATION (ADJOINING SPACES: IMC 402.3)		147	9.03	UH-110	
GROUNDS DIVISION	2451	0	N/A	0	0.06	147.06	147.06	NATURAL VENTILATION (BAY DOORS: IMC 402.1)		672	27.41	N/A	

SCHEDULE OF CONDENSING UNITS / HEAT PUMPS									
NOTES: 1. PROVIDE WITH REMOTE MOUNTED WIRED 24/7 PROGRAMMABLE THERMOSTAT. 2. CONTRACTOR SHALL PIPE UNITS PER MANUFACTURER RECOMMENDATIONS. 3. PROVIDE OUTDOOR UNIT WITH WIND BAFFLES. 4. INDOOR UNIT SHALL BE POWERED BY OUTDOOR UNIT. ROUTE MANUFACTURER RECOMMENDED CABLING BETWEEN CONDENSING UNIT AND INDOOR UNIT.									
MARK	MANUFACTURER	MODEL No.	CAPACITY	MINIMUM EFFICIENCY (EER/SEER)	MINIMUM STARTING AND OPERATING TEMPERATURE	ELECTRICAL CHARACTERISTICS			NOTES
						VOLTAGE	PHASE	MCA/MOP (AMPS)	
HP-1	MITSUBISHI	NTXSST12B112AA	120000.0 Btu/h	23.3	23 °F	208	1	11	ALL
HP-2	MITSUBISHI	NTXSST12B112AA	120000.0 Btu/h	23.3	23 °F	208	1	11	ALL

SCHEDULE OF ELECTRIC UNIT HEATERS										
NOTES: 1. PROVIDE UNITS WITH CIRCUIT BREAKERS AND INTERNAL TRANSFORMER. 2. PROVIDE WITH REMOTE THERMOSTAT. 3. PROVIDE UNIT WITH FACTORY INSTALLED FAN SPEED & HEAT SELECTOR SWITCH. 4. PROVIDE UNIT WITH DISCONNECT SWITCH AND OVERLOAD PROTECTION. 5. SHOP DRAWINGS MUST INCLUDE PERFORMANCE DATA OR THEY WILL BE REJECTED.										
MARK	MANUFACTURER	MODEL No.	HEATING CAPACITY	CFM	KW	MOTOR H.P.	FRPM	ELECTRICAL CHARACTERISTICS		NOTES
								VOLTAGE	PHASE	
UH-105A	QMARK	MUH-25-2	63.8 Btu/h	2100	18.7	1/4	2100	208	3	ALL
UH-105B	QMARK	MUH-25-2	68.2 Btu/h	2100	18.7	1/4	2100	208	3	ALL
UH-110	QMARK	MUH-07-6	25.6 Btu/h	650	7.5	1/30	1600	208	1	ALL

SCHEDULE OF LOUVERS													
NOTES: 1. DESIGN SHALL BE DRAINABLE PREVENT INFILTRATION OF WIND DRIVEN RAIN. 2. PROVIDE BIRDSCREEN. 3. SHOP DRAWINGS MUST INCLUDE PERFORMANCE DATA OR THEY WILL BE REJECTED.													
MARK	MANUFACTURER	MODEL No.	DESCRIPTION			TYPE	CFM	PRESSURE DROP	VELOCITY	FREE AREA VELOCITY	FREE AREA	CONNECTION DUCT SIZE	NOTES
L-105	GREENHECK	GCE-402	4 IN GRAVITY EXHAUST DAMPER, DRAINABLE			GRAVITY	3000	0.03 in-wg	250 FPM	634.5	5 SF	42" x 42"	WALL ALL

NOTE:
MECHANICAL (HVAC) DRAWINGS

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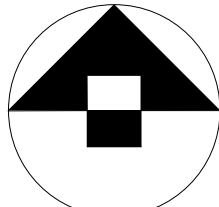
David G. Manders AIA AI-07220
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Project

NEW POLE BARN FOR CITY OF VINELAND PUBLIC WORKS

Drawing

HVAC ROOF PLAN, SPECIFICATIONS & SCHEDULE



Scale

As indicated

Job

23.089

Sheet

M1.1

Drawn

JJW

Date

10/08/2024

HVAC SYMBOLS AND ABBREVIATIONS LEGEND

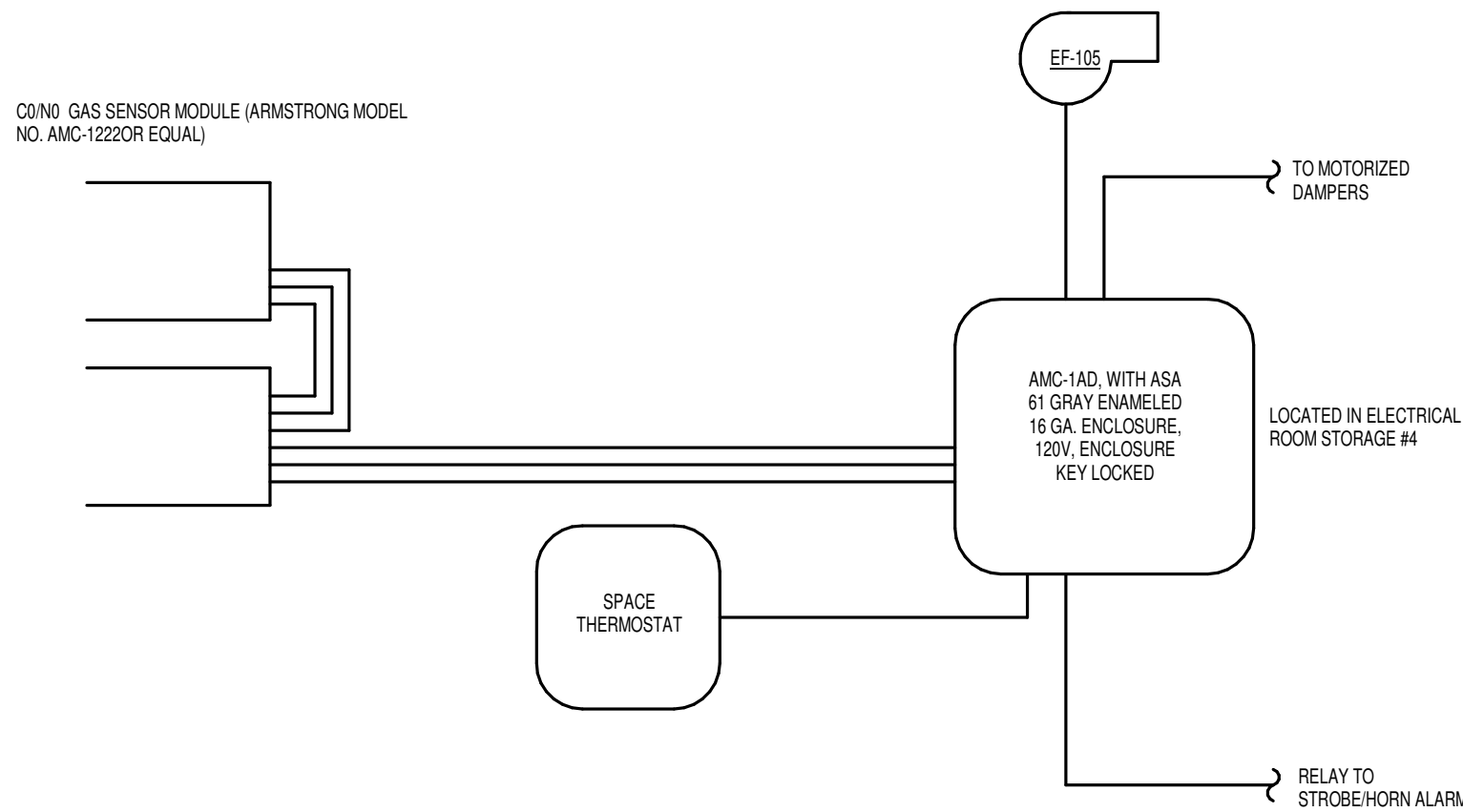
SYMBOLS			
3D	2D		
		ADJUSTABLE ROOM THERMOSTAT	E.A. EXHAUST AIR
		CARBON MONOXIDE SENSOR	CAP. CAPACITY
		BATHROOM EXHAUST FAN	PRESS. PRESSURE
		WALL EXHAUST FAN	TEMP. TEMPERATURE
		LOUVER	MIN. MINIMUM
		UNIT HEATER	MAX. MAXIMUM
		CABINET UNIT HEATER	AUTO. AUTOMATIC
		SPLIT SYSTEM AIR HANDLER	EX EXISTING
		HEAT PUMP	CONC. CONCRETE
			BTUH BTUIH
			A.F.F. ABOVE FINISHED FLOOR
			EF EXHAUST FAN
			CONN. CONNECTION
			HTR HEATER
			CLG. CEILING
			T.C. TEMPERATURE CONTROL
			MECH. MECHANICAL
			RM ROOM
			S.P. STATIC PRESSURE
			SHT. SHEET
			ASSOC. ASSOCIATED
			REF. REFERENCE
			UH UNIT HEATER

GENERAL NOTES:

- A. CONTRACTOR SHALL PROVIDE MANUFACTURER'S RECOMMENDED ACCESS TO ALL EQUIPMENT. ACCESS SHALL BE REMOVABLE CEILING TILES OR CEILING ACCESS PANELS. COORDINATE LOCATION OF MECHANICAL EQUIPMENT WITH OTHER TRADES TO AVOID CONFLICT.
- B. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN FOR LOCATION OF GRILLES AND DIFFUSERS.
- C. FOR ALL WALLS THAT ARE EXTENDED TO STRUCTURE PROVIDE SLEEVES FOR PIPING AND DUCTWORK PENETRATING WALLS (REFERENCE SPECIFICATIONS).
- D. DRAWINGS ARE DIAGRAMMATIC. PROVIDE ADDITIONAL OFFSETS, TRANSITIONS, ETC. AS REQUIRED TO AVOID INTERFERENCE'S ENCOUNTERED. FULL COORDINATION DRAWINGS WITH OTHER TRADES ARE REQUIRED.
- E. IF THE CONTRACTOR DOES NOT CLEARLY UNDERSTAND THESE PLANS OR IS NOT SURE OF THEIR MEANING, HE SHOULD OBTAIN THE ARCHITECTS WRITTEN EXPLANATION AND INTERPRETATION PRIOR TO SUBMITTING HIS BID. SINCE THE CONTRACTORS WILL BE HELD RIGIDLY TO THE INTERPRETATION OF THE ARCHITECT.
- F. CUT, PATCH, REPAIR AND RESTORE TO ORIGINAL CONDITION ALL OPENINGS IN WALLS, FLOORS, CEILINGS, ETC. WHERE REQUIRED. PATCHING SHALL MATCH EXISTING CONSTRUCTION & FINISHES. COORDINATE ALL PATCHING AND FINISHES WITH ARCHITECT.

Landis Sewerage Authority Locker Room: Required OA Calc.

Unit	Room #	Room Tag	Area	cfm/sqft	Occupant Density	OA cfm/person	Required OA	Unit OA cfm
DSS-1	108	Office	93	0.06	1.00	5	11	11
DSS-2		IT Room	53.1	0	0.00	0	0	0
CUH-105	105	Janitors Closet	26	0	0.00	0	0	0
CUH-106	106	Bathroom	48	0	1.00	0	0	0
CUH-107	107	Vestibule	102	0.06	0.00	0	6	6
UH-110	110	Storage Area #1	1627	0.06	0.00	0	98	98
UH-105A	105	Storage Area #4	3835	0.06	0.00	0	230	230



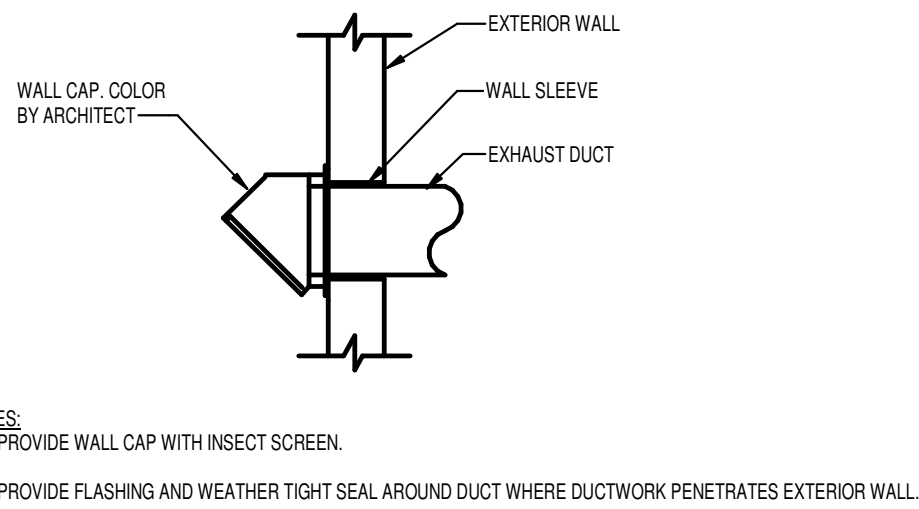
CARBON MONOXIDE GAS SENSOR MODULE
SCALE: NONE

- NOTES:
- PROVIDE ONE CO/NO. SENSOR FOR EACH 5,000 SQUARE FEET OF GARAGE SPACE AS INDICATED.
 - THE MONITORING STATION SHALL ACCEPT DIGITAL INPUTS FROM UP TO FOUR SENSORS TO PROVIDE ALARM STATUS INDICATION FOR EACH CHANNEL.
 - THE NORMALLY OPEN FAN RELAY CONTACTS ON THE MONITOR SHALL BE USED AS NORMALLY CLOSED MOTOR STARTERS, PILOT RELAY, OR CONTRACTOR.
 - WHEN ANY SENSOR DETECTS CO LEVELS ABOVE 25ppm OR IF A FAULT IS DETECTED, THE CORRESPONDING ALARM STATUS INDICATOR SHALL LIGHT, AND THE FAN RELAY DE-ENERGIZE, CAUSING THE CORRESPONDING FANS TO RUN PER SEQUENCE BELOW.
 - IF SPACE TEMPERATURE EXCEEDS 80°F (AQL) THE CORRESPONDING FANS SHALL RUN REGARDLESS OF THE CO MONITOR STATUS.
 - WHEN CO/NO. RETURNS TO SAFE LEVELS, AND TEMPERATURE DROPS BELOW SPACE SET POINT, EXHAUST FAN SHALL GO TO MINIMUM RUNNING STATUS.

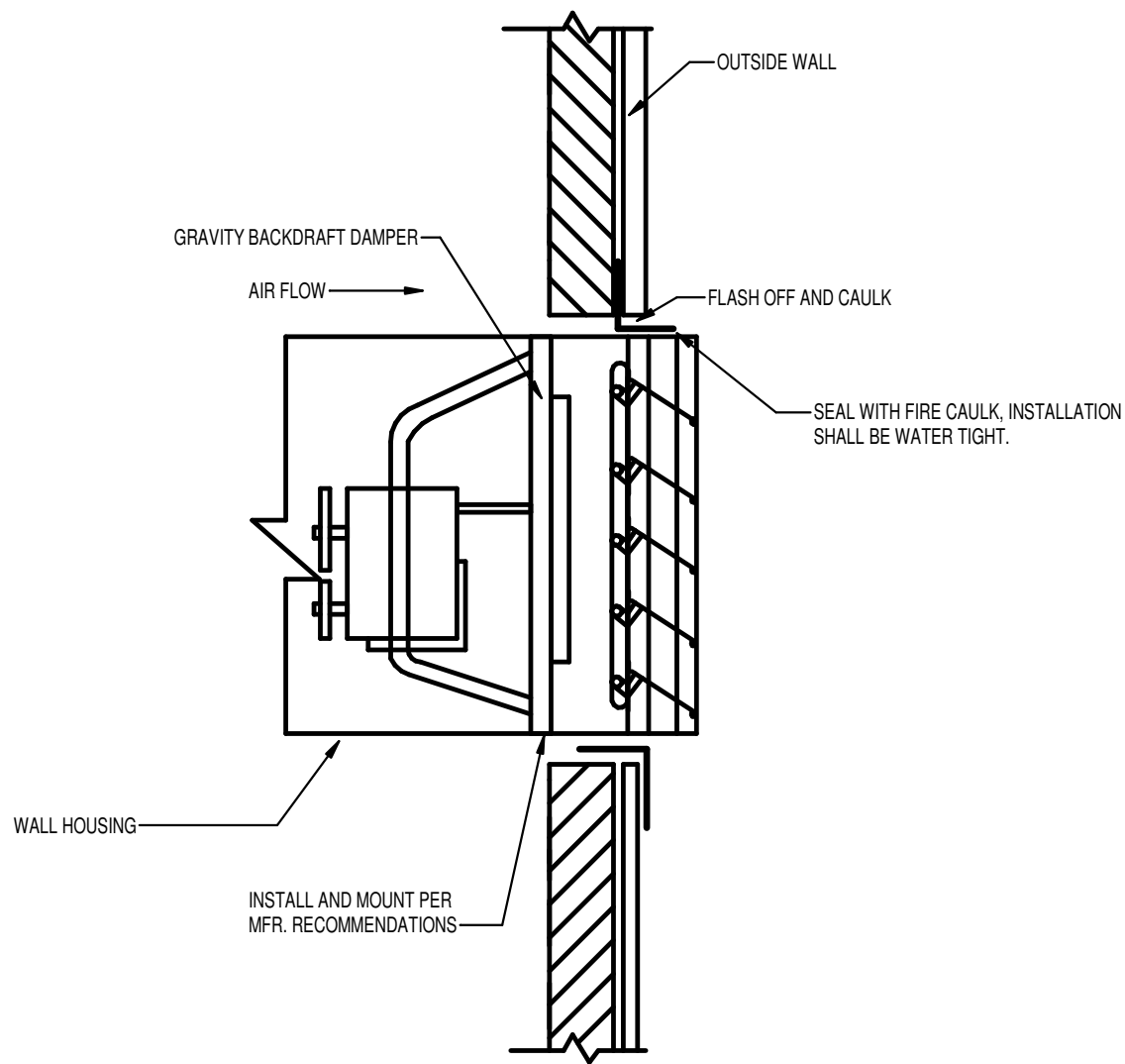
EF-105 STORAGE EXHAUST
FANS SEQUENCE OF OPERATION

- THRESHOLD #1: BELOW 25 PPM ONE (1) EXHAUST FAN SHALL RUN AT MINIMUM RPM TO BRING IN FRESH AIR AND MAINTAIN SATISFACTORY CO/NO. FAN STATUS SHALL BE MONITORED BY CURRENT SENSOR AND DIFFERENTIAL FLOW SWITCH.
- THRESHOLD #2: HIGH ALARM LEVEL TRIP AT 75 PPM THE CONTROLLER SHALL TURN ON HORN/SBUZZER AND ALARM LED LOCATED ON CONTROLLER OF HIGH PPM CO/NO. CONCENTRATIONS AND DIAL ALARM THROUGH MODEM TO DESIGNATED MAINTENANCE MONITORING PHONE NUMBER.
- INTERLOCK MOTOR OPERATED DAMPERS ON OUTDOOR AIR LOUVERS TO OPEN AT THRESHOLD #2.
- IF SPACE TEMPERATURE EXCEEDS 80°F (AQL) ONE (1) EXHAUST FAN SHALL RAMP UP PROPORTIONALLY TO HIGH SPEED. SECOND FAN SHALL CONTINUE IN STAND-BY MODE.

1 PARKING GARAGE EXHAUST FAN SEQUENCE OF OPERATION
SCALE: NONE

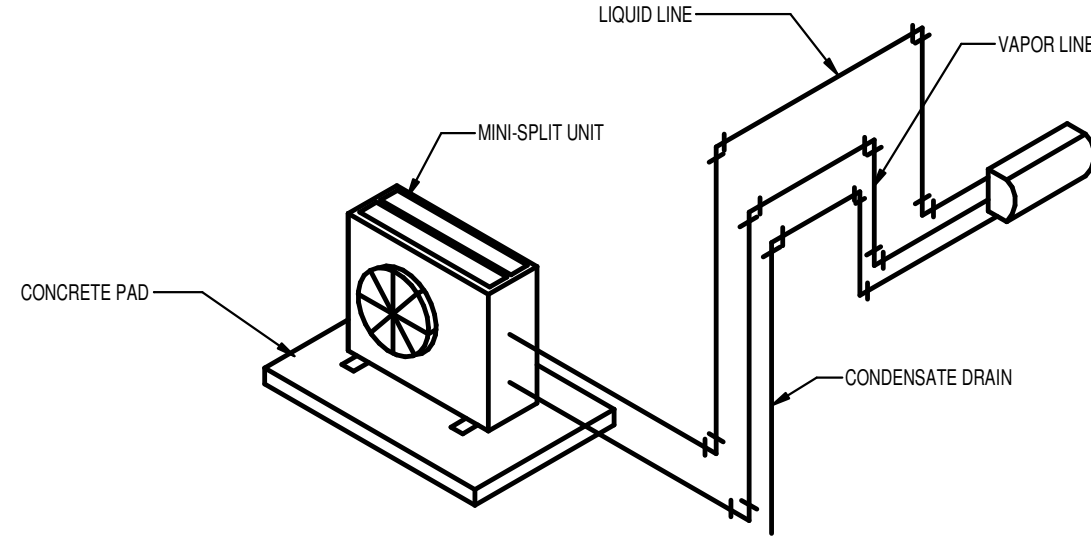


2 SIDEWALL EXHAUST DETAIL
SCALE: NONE



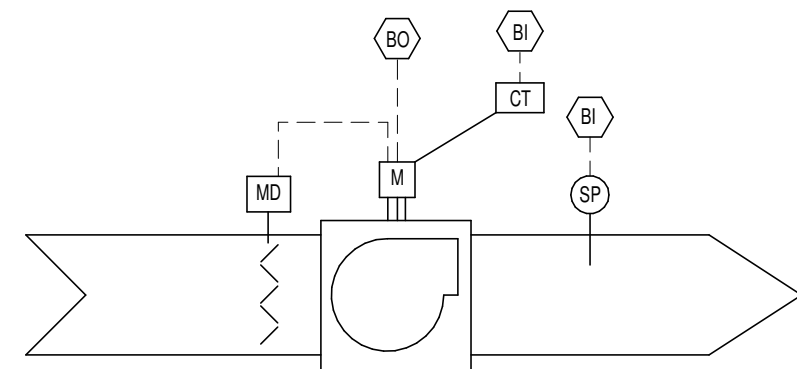
- NOTES:
- CONTRACTOR SHALL COORDINATE DIMENSION WITH ARCHITECT AND FRAMING CONTRACTOR.
 - CONTRACTOR SHALL COORDINATE ALL CODE AND MANUFACTURER CLEARANCES BEFORE INSTALLATION.

3 EXHAUST FAN DETAIL (SIDEWALL)
SCALE: NONE



- NOTES:
- SEE MANUFACTURER'S PIPING DIAGRAM FOR SIZING, CHARGING AND LONG LINE SET REQUIREMENTS.
 - SEE MANUFACTURER'S INSTALLATION MANUAL FOR TORQUE REQUIREMENTS ON LIQUID AND VAPOR PIPE FLARE FITTINGS.
 - PVC SLEEVES AT ALL WALL, FLOOR AND CEILING PENETRATIONS.
 - SEE PLAN FOR CONDENSATE ROUTING.
 - ANCHOR OUTSIDE UNIT TO CONCRETE PAD.

4 MINISPLIT/HEAT PUMP PIPING (PAD)
SCALE: NONE



EXHAUST FANS CONTROL DIAGRAM
SCALE: NONE

EXHAUST FANS
SEQUENCE OF OPERATION

REF: FAN SHALL RUN WHEN BATHROOM LIGHTS ARE ON.

5 EXHAUST FAN CONTROLS
SCALE: NONE

NOTE:
MECHANICAL (HVAC) DRAWINGS

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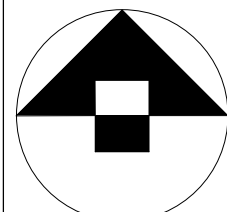
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HVAC GENERAL NOTES,
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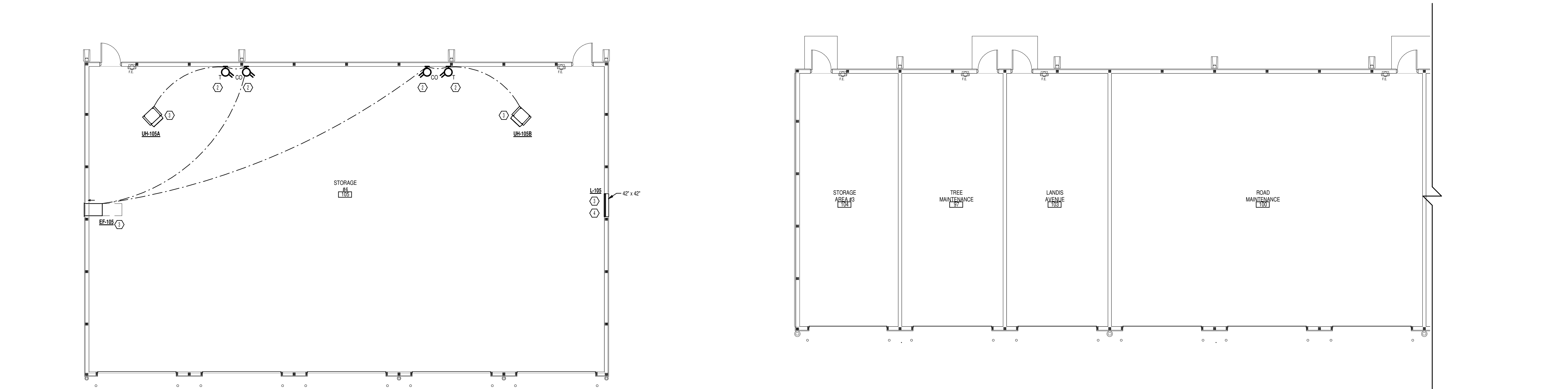
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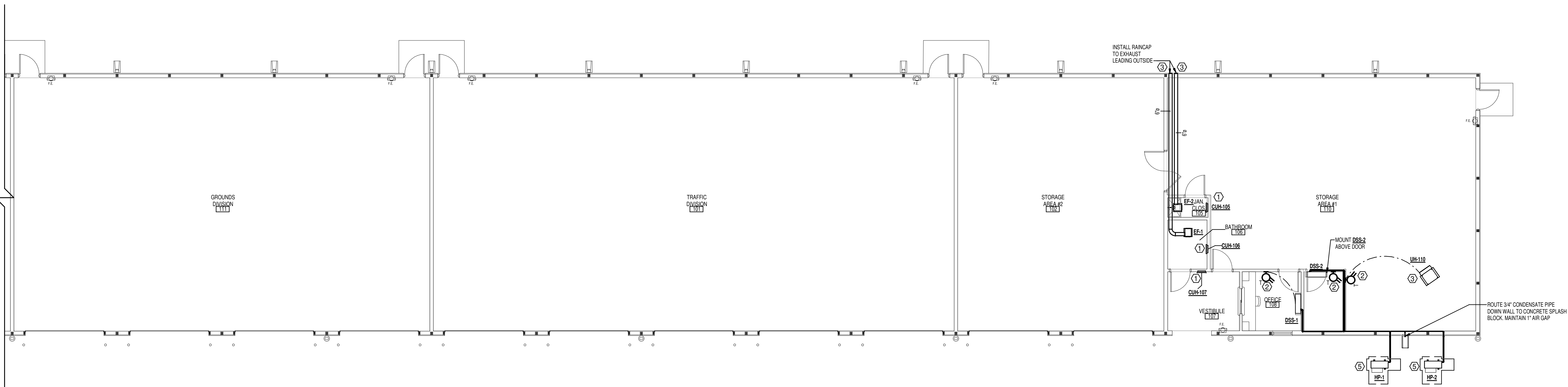
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1 HVAC DUCTWORK PLAN BCCLT - AREA A
SCALE: NONE



2 HVAC DUCTWORK PLAN BCCLT - AREA B
SCALE: 1/8\"/>

NOTE:
MECHANICAL (HVAC) DRAWINGS

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- KEYED NOTES:**
1. MOUNT CABINET HEATER 18\"/>

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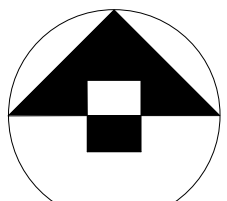
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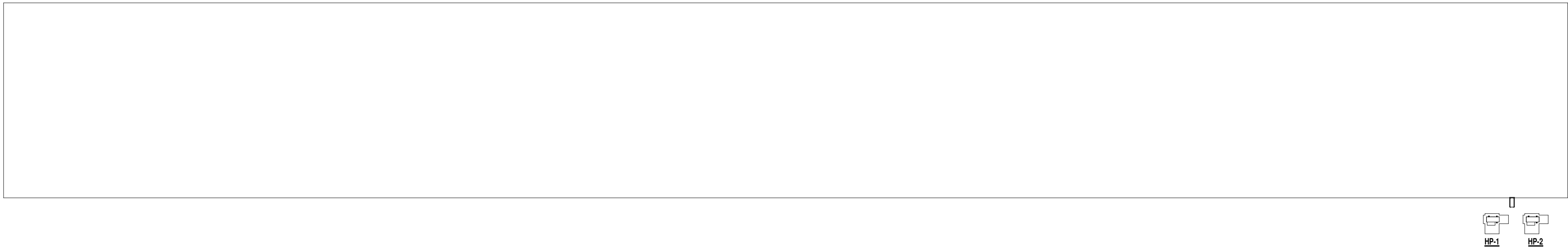
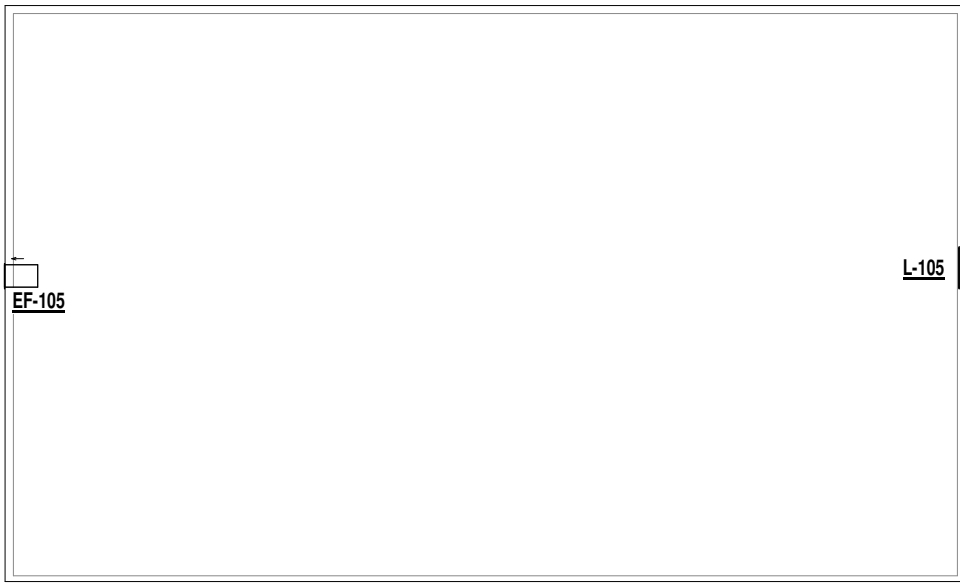
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Project

**NEW POLE BARN FOR CITY
OF VINELAND PUBLIC
WORKS**

Drawing		
HVAC DUCTWORK PLAN		
Scale	Job	Sheet M1.0
1/8" = 1'-0"	23.089	
Drawn	Date	
JJW	10/08/2024	





2 HVAC ROOF PLAN
SCALE: 1/16" = 1'-0"

SCHEDULE OF MINI SPLIT SYSTEMS										
NOTES: 1. PROVIDE WITH REMOTE MOUNTED LCD DISPLAY WITH TEMPERATURE SETTING AND FAN SPEED CONTROL. 2. PROVIDE UNIT WITH CONDENSATE PUMP. 3. CONTRACTOR SHALL PIPE UNITS PER MANUFACTURER RECOMMENDATIONS. 4. VALUES LISTED CORRESPOND TO HIGH SETTING OF THE UNIT. 5. SHOP DRAWINGS MUST INCLUDE PERFORMANCE DATA OR THEY WILL BE REJECTED.										
MARK	MANUFACTURER	MODEL No.	TOTAL COOLING CAPACITY TOTAL	HEATING CAPACITY	CFM	SPL (dBA)	ELECTRICAL CHARACTERISTICS			NOTES
							VOLTAGE	PHASE	MCA	
DSS-1	MITSUBISHI ELECTRIC	NTXWST12B112AA	12000.0 Btu/h	14400 Btu/h	276	43	208	1	1 A	ALL
DSS-2	MITSUBISHI ELECTRIC	NTXWST12B112AA	12000.0 Btu/h	14400 Btu/h	276	43	208	1	1 A	ALL

SCHEDULE OF CONDENSING UNITS / HEAT PUMPS										
NOTES: 1. PROVIDE WITH REMOTE MOUNTED WIRED 24/7 PROGRAMMABLE THERMOSTAT. 2. CONTRACTOR SHALL PIPE UNITS PER MANUFACTURER RECOMMENDATIONS. 3. PROVIDE OUTDOOR UNIT WITH WIND BAFFLES. 4. INDOOR UNIT SHALL BE POWERED BY OUTDOOR UNIT. ROUTE MANUFACTURER RECOMMENDED CABLING BETWEEN CONDENSING UNIT AND INDOOR UNIT.										
MARK	MANUFACTURER	MODEL No.	CAPACITY	MINIMUM EFFICIENCY (EER/SEER)	MINIMUM STARTING AND OPERATING TEMPERATURE	ELECTRICAL CHARACTERISTICS				
						VOLTAGE	PHASE	MCA/MOP (AMPS)		
HP-1	MITSUBISHI	NTXSST12B112AA	120000.0 Btu/h	23.3	23 °F	208	1	11	ALL	
HP-2	MITSUBISHI	NTXSST12B112AA	120000.0 Btu/h	23.3	23 °F	208	1	11	ALL	

SCHEDULE OF ELECTRIC CABINET HEATER									
NOTES: 1. COLOR AS SELECTED BY ARCHITECT FROM MANUFACTURER STANDARD COLORS. 2. CONTRACTOR TO FIELD VERIFY LENGTH OF MOUNTING WALL WITH SHOP DRAWING SUBMITTAL. 3. PROVIDE WITH DISCONNECT SWITCH, THERMOSTAT, RELAYS, AND ALL ACCESSORIES FOR SINGLE POINT OF ELECTRIC CONNECTION UTILIZATION. 4. PROVIDE WITH SEMI-RECESSED MOUNTING SLEEVE. 5. SHOP DRAWINGS MUST INCLUDE PERFORMANCE DATA OR THEY WILL BE REJECTED.									
MARK	MANUFACTURER	MODEL No.	SIZE	HEATING CAPACITY	WATTS	ELECTRICAL CHARACTERISTICS		MOUNTING	NOTES
						VOLTAGE	PHASE		
CUH-105	QMARK	CWH1101DSF	14AWG	3413.0 Btu/h	1000 W	120	1	WALL	ALL
CUH-106	QMARK	CWH1101DSF	14AWG	3413.0 Btu/h	1000 W	120	1	WALL	ALL
CUH-107	QMARK	CWH1101DSF	14AWG	3413.0 Btu/h	1000 W	120	1	WALL	ALL

SCHEDULE OF ELECTRIC UNIT HEATERS										
NOTES: 1. PROVIDE UNITS WITH CIRCUIT BREAKERS AND INTERNAL TRANSFORMER. 2. PROVIDE WITH REMOTE THERMOSTAT. 3. PROVIDE UNIT WITH FACTORY INSTALLED FAN SPEED & HEAT SELECTOR SWITCH. 4. PROVIDE UNIT WITH DISCONNECT SWITCH AND OVERLOAD PROTECTION. 5. SHOP DRAWINGS MUST INCLUDE PERFORMANCE DATA OR THEY WILL BE REJECTED.										
MARK	MANUFACTURER	MODEL No.	HEATING CAPACITY	CFM	KW	MOTOR H.P.	FRPM	ELECTRICAL CHARACTERISTICS		NOTES
								VOLTAGE	PHASE	
UH-105A	QMARK	MUH-25-2	63.8 Btu/h	2100	18.7	1/4	2100	208	3	ALL
UH-105B	QMARK	MUH-25-2	68.2 Btu/h	2100	18.7	1/4	2100	208	3	ALL
UH-110	QMARK	MUH-07-6	25.6 Btu/h	650	7.5	1/30	1600	208	1	ALL

SCHEDULE OF EXHAUST FANS												
NOTES: 1. PROVIDE WITH BACKDRAFT DAMPER AND DISCONNECT. 2. SHOP DRAWINGS MUST INCLUDE PERFORMANCE DATA OR THEY WILL BE REJECTED. 3. FAN OPERATES WITH LIGHTSWITCH. 4. FAN OPERATES WITH CO2 SENSOR												
MARK	AREA SERVED	MANUFACTURER	MODEL No.	SIZE	HP	FRPM	CFM	STATIC PRESSURE	ELECTRICAL CHARACTERISTICS		FAN MOUNTING	NOTES
									VOLTAGE	PHASE		
EF-1	BATHROOM	GREENHECK	SP	870	16 WATTS	675	71	0.13 in-wg	115	1	CEILING	1,2,3
EF-2	JANITORS CLOSET	GREENHECK	SP	870	16 WATTS	675	71	0.13 in-wg	115	1	CEILING	1,2,3
EF-105	STORAGE #4	GREENHECK	SE1-16	428 VG	3/4	1716	3000	0.25 in-wg	115	1	WALL	1,2,4

SCHEDULE OF LOUVERS													
NOTES: 1. DESIGN SHALL BE DRAINABLE PREVENT INFILTRATION OF WIND DRIVEN RAIN. 2. PROVIDE BIRDSCREEN. 3. SHOP DRAWINGS MUST INCLUDE PERFORMANCE DATA OR THEY WILL BE REJECTED.													
MARK	MANUFACTURER	MODEL No.	DESCRIPTION			TYPE	CFM	PRESSURE DROP	VELOCITY	FREE AREA VELOCITY	FREE AREA	CONNECTION DUCT SIZE	NOTES
L-105	GREENHECK	GCE-402	4 IN GRAVITY EXHAUST DAMPER, DRAINABLE			GRAVITY	3000	0.03 in-wg	250 FPM	634.5	5 SF	42" x 42"	ALL

BUILDING VENTILATION CHART													
NAME	AREA (SF)	OCCUPANT DENSITY	OA CFM/PERSON	PERSON OA RQMT	CFM/SQFT	SPACE OA RQMT (CFM)	TOTAL OA RQMT (CFM)	OA PROVIDED		NATURAL OA (SQFT)	NATURAL OA %	UNIT SERVING AREA	
Storage Area # 4	3835	0	N/A	0	0.06	230.1	230.1	NATURAL VENTILATION (BAY DOORS: IMC 402.1)		840	21.9	UH-105A, UH-105B, EF-105	
TREE MAINTENANCE	597	0	N/A	0	0.06	35.82	35.82	NATURAL VENTILATION (BAY DOORS: IMC 402.1)		168	28.14	N/A	
ROAD MAINTENANCE	1833	0	N/A	0	0.06	109.98	109.98	NATURAL VENTILATION (BAY DOORS: IMC 402.1)		504	27.49	N/A	
TRAFFIC DIVISION	3065	0	N/A	0	0.06	183.9	183.9	NATURAL VENTILATION (BAY DOORS: IMC 402.1)		840	27.40	N/A	
STORAGE AREA #2	1213	0	N/A	0	0.06	72.78	72.78	NATURAL VENTILATION (BAY DOORS: IMC 402.1)		336	27.69	N/A	
LANDIS AVENUE	597	0	N/A	0	0.06	35.82	35.82	NATURAL VENTILATION (BAY DOORS: IMC 402.1)		168	28.14	N/A	
STORAGE AREA #3	612	0	N/A	0	0.06	36.72	36.72	NATURAL VENTILATION (BAY DOORS: IMC 402.1)		168	27.45	N/A	
JAN. CLOS.	18	0	N/A	0	0.06	1.08	1.08	EX-HUAIST		N/A	N/A	EF-2	
BATHROOM	48	1	N/A	0	N/A	N/A	N/A	EX-HUAIST		N/A	N/A	EF-1	
VESTIBULE	102	0	N/A	0	0.06	6.12	6.12	NATURAL VENTILATION (ADJOINING SPACES: IMC 402.3)		42	41.17	CUH-107	
OFFICE	93	1	5	5	0.06	5.58	10.58	NATURAL VENTILATION (ADJOINING SPACES: IMC 402.3)		42	45.16	DSS-1	
STORAGE AREA #1	1627	0	N/A	0	0.06	97.62	97.62	NATURAL VENTILATION (ADJOINING SPACES: IMC 402.3)		147	9.03	UH-110	
GROUNDS DIVISION	2451	0	N/A	0	0.06	147.06	147.06	NATURAL VENTILATION (BAY DOORS: IMC 402.1)		672	27.41	N/A	

NOTE:
MECHANICAL (HVAC) DRAWINGS

This work will be performed by the owner.

Successful contractor will need to coordinate their work with the owner's workforce.

This information is supplied for information only.

RELEASE / REVISION

No.	Date	Description



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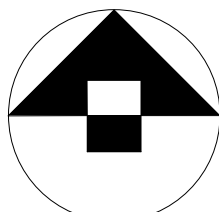
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Project

NEW POLE BARN FOR CITY OF VINELAND PUBLIC WORKS

Drawing

HVAC ROOF PLAN, SPECIFICATIONS & SCHEDULE



Scale

As indicated

Job

23.089

Drawn

JJW

Date

10/08/2024

Sheet

M1.1

LIGHTING

WALL MOUNTED LIGHTING FIXTURE AS SCHEDULED.

CEILING OUTLET AND LIGHTING FIXTURE AS SCHEDULED.

CEILING OUTLET AND LIGHTING FIXTURE ON EMERGENCY POWER AS SCHEDULED.

CEILING OUTLET AND EXT LIGHT FIXTURE AS SCHEDULED.

WALL OUTLET AND EXT LIGHT FIXTURE AS SCHEDULED.

ARROWS INDICATE EGRESS EXIT SIGNAGE (CHEVRONS) REQUIRED.

SYMBOL INDICATES FIXTURE TYPE WHEN SHOWN ON LIGHTING PLANS ADJACENT TO FIXTURE.

LOWER CASE LETTERS AT OUTLETS INDICATES SWITCHING ARRANGEMENT.

SINGLE POLE 20A, 120V/277V SWITCH, MOUNT 48" A.F.F. TO TOP, UNLESS NOTED OTHERWISE.

3-3 THREWAY
2P - TWO POLE
MS - VACUANCY SENSOR
LV - LOW VOLTAGE, ACUTY 1P/0M OR APPROVED EQUAL.

OUTLET BOX IN WALL AT 44" TO BOTTOM AND DIMMER SWITCH WITH DUAL TECHNOLOGY VACANCY SENSOR SWITCH, ACUTY WSK DPT OR APPROVED SIMILAR.

OUTLET BOX IN WALL AT 44" TO BOTTOM AND LOW VOLTAGE DIMMER SWITCH WITH DUAL TECHNOLOGY VACANCY SENSOR SWITCH, ACUTY WSK DPT LV OR APPROVED SIMILAR.

CEILING OUTLET AND DUAL TECHNOLOGY MOTION SENSOR FOR LIGHTING CONTROL, ACUTY HCM 6 LT OR APPROVED SIMILAR.

OUTLET BOX MOUNTED MOTION LOW VOLTAGE SENSOR POWER PACK WITH DIMMING OUTPUT, ACUTY HPF10 D EPC OR APPROVED SIMILAR.

LIGHTING CONTROL DAYLIGHT SENSOR, SUBSCRIPT INDICATES THE LIGHTING SWITCH LEG LETTER OF THE FIXTURES THAT IT SHALL CONTROL, ACUTY HCM ADCX OR APPROVED SIMILAR.

POWER

WALL MOUNTED JUNCTION BOX, MOUNT AT 18" A.F.F. TO BOTTOM, UNLESS NOTED OTHERWISE.

CEILING OR FLOOR MOUNTED JUNCTION BOX

WALL OUTLET WITH 20A, 120V DUPLEX RECEPTACLE, MOUNT 18" A.F.F. TO BOTTOM, UNLESS NOTED OTHERWISE.

WALL OUTLET WITH 20A, 120V DOUBLE DUPLEX (QUADRAPLEX) RECEPTACLE, MOUNT AT 18" A.F.F. TO BOTTOM UNLESS NOTED OTHERWISE.

DOOR HARDWARE POWER SUPPLY.

208Y/120V SURFACE MOUNTED PANELBOARD, DASH LINE INDICATES N.E.C. CLEARANCE.

FUSIBLE DISCONNECT SWITCH, MOUNT 4'-6" A.F.F. TO CENTER, UNLESS NOTED OTHERWISE.

MOTOR CONTROLLER AND FUSIBLE DISCONNECT SWITCH TO SUIT MOTOR, MOUNT 4'-6" A.F.F. TO CENTER, UNLESS NOTED OTHERWISE.

MOTOR.

MANUAL MOTOR CONTROLLER WITH PILOT LIGHT TO SUIT MOTOR, MOUNT 4'-6" A.F.F. TO BOTTOM, UNLESS NOTED OTHERWISE.

POLYMER CONCRETE HANDHOLE AS INDICATED.

BRANCH CIRCUIT VOLTAGE DROP TABLE

WIRE SIZE	MAXIMUM CIRCUIT LENGTH
20A, 120V, 1P	
#12 AWG	61 FEET
#10 AWG	102 FEET
#8 AWG	154 FEET
#6 AWG	240 FEET

LENGTHS REPRESENT THE MAXIMUM CIRCUIT LENGTH BASED ON THE WIRE SIZE AND COPPER CONDUCTORS FOR A MINIMUM VOLTAGE DROP OF 3%.

LENGTHS SHALL BE MEASURED FROM PANELBOARD TO THE FARTHEST DEVICE CONNECT TO CIRCUIT.

THE PHASE AND NEUTRAL CONDUCTORS SHALL BE SIZED AS INDICATED FOR THE ENTIRE LENGTH OF RUN.

IF CONDUCTORS ARE UPSIZED FOR VOLTAGE DROP, GROUND CONDUCTORS SHALL ALSO BE UPSIZED PER NEC 250.122.

GENERAL DEVICE SUBSCRIPTS

"1,2,3"

NUMBER AT OUTLET INDICATES CIRCUIT ARRANGEMENT.

"NL"

SUBSCRIPT INDICATED LIGHTING FIXTURE IS NON-SWITCHED AND SERVES AS NIGHTLIGHT.

"GFI"

INDICATES GROUND FAULT CURRENT INTERRUPTER DEVICE.

"S"

INDICATES SURFACE MOUNTED DEVICE WHEN INDICATED ON POWER & SYSTEMS PLANS.

"WP"

INDICATES WEATHER PROOF WHEN SHOWN ADJACENT TO SYMBOLS ON LIGHTING, POWER, OR SYSTEMS PLANS. PROVIDE APPROPRIATE ENCLOSURES AND/OR COVERS.

RACEWAYS

CIRCUIT BURIED UNDERGROUND OR CONCEALED BENEATH FLOOR.

CIRCUIT EXPOSED.

CIRCUIT CONCEALED IN CEILING OR WALL, CROSSBARS INDICATE NUMBER OF CONDUCTORS REQUIRED. CONDUIT NOT SIZED IS 1/2" CONDUCTORS NOT SIZED ARE NO. 12.

HOMERUN TO PANELBOARD INDICATED, NUMBER OF ARROWHEADS INDICATES CIRCUIT NUMBERS, PREFIX INDICATES PANEL NUMBER.

EQUIPMENT POINT OF CONNECTION, VERIFY WITH EQUIPMENT PROVIDER AND/OR INSTALLER.

J-HOOK SUPPORTING SYSTEM MOUNTED IN ACCESSIBLE CEILING CAVITY.

UTILITY OVERHEAD LINES.

UNDER GROUND LINES.

SECURITY AND COMMUNICATIONS

CARD FOR READER, MOUNT AT 44" A.F.F. TO BOTTOM, UNLESS NOTED OTHERWISE. READER PROVIDED BY OWNER.

KEYPAD, MOUNT AT 44" A.F.F. TO BOTTOM, UNLESS NOTED OTHERWISE. KEYPAD PROVIDED BY OWNER.

ACCESS CONTROL DOOR RELEASE BUTTON, MOUNT AT 44" A.F.F. TO BOTTOM, UNLESS STATED OTHERWISE.

ACCESS CONTROLLED DOOR, SUBSCRIPT INDICATES TYPE. COORDINATE REQUIREMENTS WITH DOOR HARDWARE PROVIDER. REFER TO RACEWAY DETAILS.

CCTV SECURITY CAMERA, PROVIDE SINGLE DATA JACK WITH CABLE BACK TO IT ROOM AND TERMINATE. CAMERA PROVIDED BY OWNER.

OUTLET BOX IN WALL WITH DATA JACKS AND DEVICE PLATE. PROVIDE 1" CONDUIT FROM OUTLET BOX TO ACCESSIBLE CEILING AND BUSH END. PROVIDE CABLE FROM EACH JACK IN OUTLET BOX TO TELECOMMUNICATIONS SYSTEM EQUIPMENT AT RACK IN IT ROOM AND TERMINATE. MOUNT 18" A.F.F. TO BOTTOM, UNLESS NOTED OTHERWISE.

#V: NO. OF VOICE JACKS
#D: NO. OF DATA JACKS

OUTLET BOX WITH (1) DATA JACK AND DEVICE PLATE FOR WIRELESS ACCESS POINT. CONTRACTOR SHALL PROVIDE 1" CONDUIT BACK TO IT ROOM. WIRELESS ACCESS POINT DEVICE SHALL BE PROVIDED BY THE OWNER.

ONE-LINE DIAGRAM

TRANSFORMER.

CIRCUIT BREAKER.

POINT OF CONNECTION TO GROUND POTENTIAL.

NON-FUSED DISCONNECT SAFETY SWITCH.

FUSE.

FUSED SAFETY SWITCH.

POINT OF CONNECTION TO EXISTING.

NORMALLY OPEN CONTACT.

NORMALLY CLOSED CONTACT.

SOLIDLY GROUNDED WYE CONNECTION.

DELTA CONNECTION.

3

SITE DATA DIAGRAM

SCALE: NONE

1

SITE PLAN

SCALE: 1" = 30'-0"

2

SITE PLAN

SCALE: 1" = 30'-0"

RELEASE / REVISION

No.	Date	Description

ELECTRICAL GENERAL NOTES:

A. PROVIDE ALL TEMPORARY EGRESS EXIT LIGHTING FIXTURES AS REQUIRED DURING CONSTRUCTION.

B. COORDINATE CONDUIT ROUTING WITH MECHANICAL CONTRACTOR TO AVOID CONFLICTS WITH EQUIPMENT AND EQUIPMENT CLEARANCES.

C. SEAL AROUND ALL NEW AND EXISTING PENETRATIONS THROUGH RATED WALLS WITH FIRE STOPPING. REFER TO ARCHITECTURAL RATINGS DETAIL KEY PLAN FOR RATED WALL LOCATIONS.

D. FINAL CONNECTION TO ALL CEILING MOUNTED DEVICES SHALL BE MADE WITH FLEX CONDUIT.

E. FIRE ALARM SYSTEM SHALL BE INSTALLED IN CONDUIT. FIRE ALARM WIRING SHALL COMPLY WITH NEC 760.

F. COORDINATE LIGHTING FIXTURE LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING PLAN.

G. PROVIDE FIRE INTUMESCENT PUTTY PAD BEHIND / AROUND ALL ELECTRICAL BACKBOXES INSTALLED WITHIN FIRE RATED WALLS. PUTTY PADS SHALL BE SPECIFIED TECHNOLOGIES, INC. SERIES SSP. INSTALL PER MANUFACTURERS RECOMMENDATIONS. REFERENCE ARCHITECTURAL RATINGS DETAIL KEY PLAN FOR RATED WALL LOCATIONS.

H. EACH BRANCH CIRCUIT SHALL INCORPORATE A DEDICATED NEUTRAL CONDUCTOR WHERE NEUTRAL IS REQUIRED. THE NEUTRAL CONDUCTOR SHALL NOT BE SHARED BETWEEN CIRCUITS UNLESS SPECIFICALLY INDICATED FOR CIRCUITS SERVING SYSTEMS FURNITURE.

I. EACH CONDUIT CONTAINING BRANCH CIRCUITS SHALL CONTAIN A GREEN EQUIPMENT GROUND CONDUCTOR.

J. 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. TOSIMILAR ANGLES AND CROSS-CROSS ARRANGEMENT WILL NOT BE ACCEPTABLE.

K. EXPOSED PARALLEL OR BANKED RACEWAYS SHALL BE RUN TOGETHER TO PROVIDE A NEAT APPEARANCE. BENDS IN PARALLEL OR BANKED RUNS SHALL BE MADE FROM THE SAME CENTER LINE SO THAT THE BENDS ARE PARALLEL. STANDARD MANUFACTURERS' BENDS ARE ALLOWED FOR GROUPS OF 90 DEGREE BENDS IF THE CONDUITS ARE CLOSE TO THE SAME SIZES. THIS SHALL REQUIRE THAT THERE BE A CHANGE IN THE PLANE OF THE RUN, SUCH AS FROM WALL TO CEILING, AND THE RACEWAYS OF THE SAME SIZE. IN OTHER CASES, PARALLEL RACEWAYS SHALL BE FIELD-BENT.

L. ALL RECEPTACLES LOCATED WITHIN 6 FEET OF A SINK OR WATER SOURCE SHALL INCLUDE INTEGRAL GROUND FAULT CIRCUIT INTERRUPTER (GFI).

M. CONDUITS SHALL NOT BE EMBEDDED IN FLOOR SLABS.

N. THE ELECTRICAL INSTALLATION SHALL BE IN STRICT CONFORMANCE WITH THE 2020 NATIONAL ELECTRICAL CODE (NEC) AND THE NEW JERSEY UNIFORM CONSTRUCTION CODE.

KEYNOTES

1. REMOVE FOR RELOCATION COMMUNICATIONS HANDHOLE.

2. EXTEND EXISTING COMMUNICATIONS CONDUIT.

3. INSTALL EXISTING COMMUNICATIONS HANDHOLE.

4. COORDINATE GATE OPERATOR LOCATION AND ELECTRIC REQUIREMENTS WITH THE OWNER. PROVIDE ALL REQUIRED ELECTRIC, INCLUDING GROUND ROD AND ASSOCIATED WIRING AND RACEWAYS. PROVIDE WIRING AND RACEWAYS TO GATE SAFETY DEVICES. INTERCONNECT GATE OPERATOR TO CARD READER. STUB OUT (1) 1" CONDUIT FOR PRESSURE SENSOR WIRING.

5. INSTALL OWNER FURNISHED ENVIRONMENTAL NETWORK CABINET ON CONCRETE PAD. COORDINATE LOCATION WITH THE OWNER BEFORE ROUGH-IN PROVIDE (1) QUAD RECEPTACLE IN CABINET FOR NETWORK EQUIPMENT.

6. INSTALL CARD ACCESS POWER SUPPLY AND CONTROL PANEL. PROVIDE STRUT STAND AS REQUIRED.

7. SECURITY CAMERA ON POLE. COORDINATE LOCATION WITH OWNER, CAMERA, POLE, AND BASE PROVIDED BY OWNER. PROVIDE RACEWAY AND DATA CABLE BACK TO NETWORK RACK.

8. PROVIDE (1) 1" CONDUIT FROM GATE OPERATOR TO SITE CARD ACCESS PANEL. ROUTE SECURITY CABLE WITH RACEWAY.

9. PROVIDE (1) 1" CONDUIT FROM GATE OPERATOR TO CARD ACCESS PANEL IN BUILDING. ROUTE SECURITY CABLE WITH RACEWAY.

10. PROVIDE (1) 1" CONDUIT FROM SITE CARD ACCESS PANEL TO SITE NETWORK RACK. ROUTE DATA CABLE BETWEEN PANEL AND CABINET.

11. VERIFY EXACT LOCATION AND REQUIREMENTS WITH OWNER'S SECURITY VENDOR.

BCCLT CONSULTING ENGINEERS

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AI-07220
AI-07473
AI-13038
AI-13618

Project

NEW POLE BARN FOR CITY OF VINELAND PUBLIC WORKS

Drawing

ELECTRICAL LEGEND, AND GENERAL NOTES

Scale

Job

Sheet

As indicated

23.089

E1.0

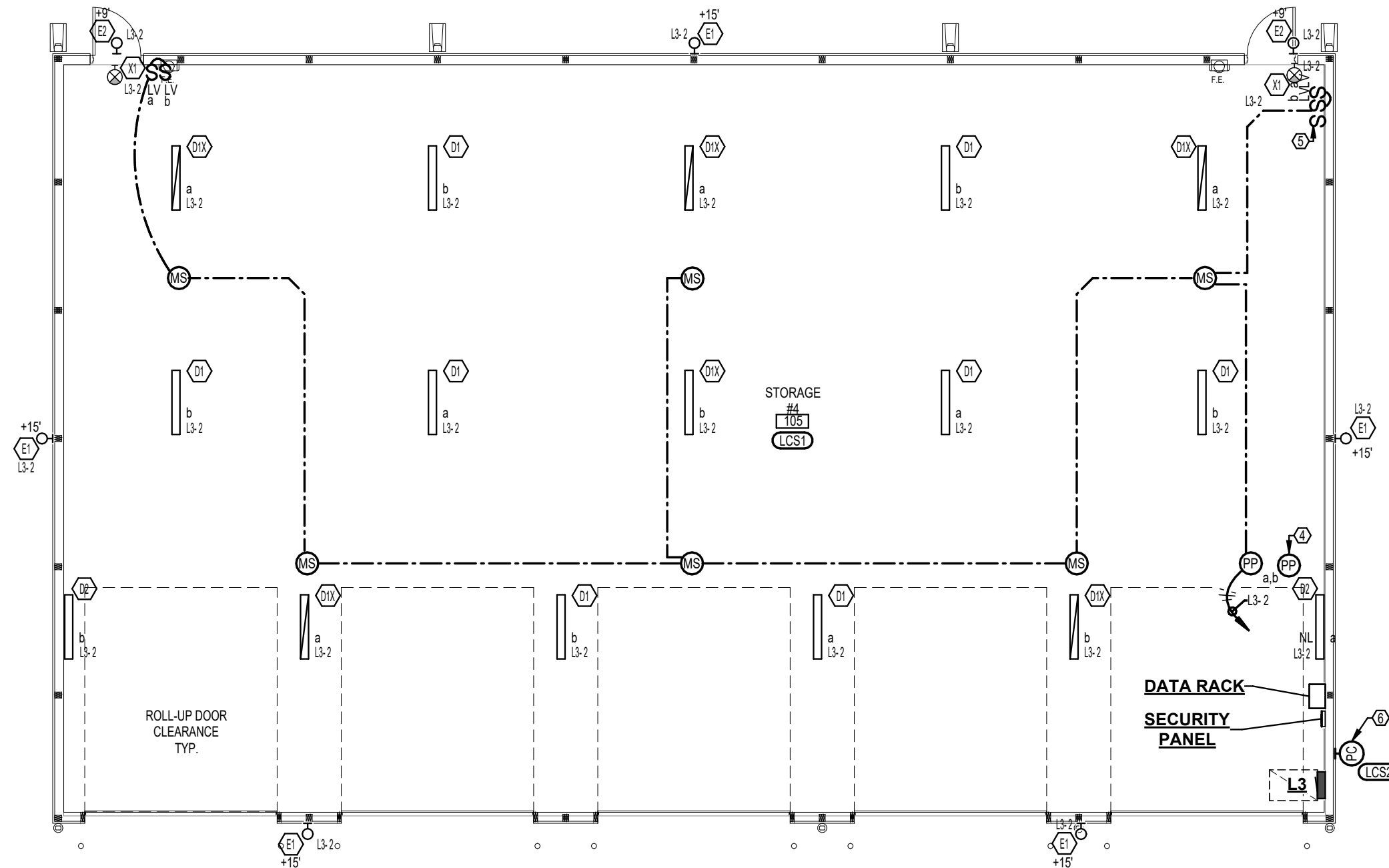
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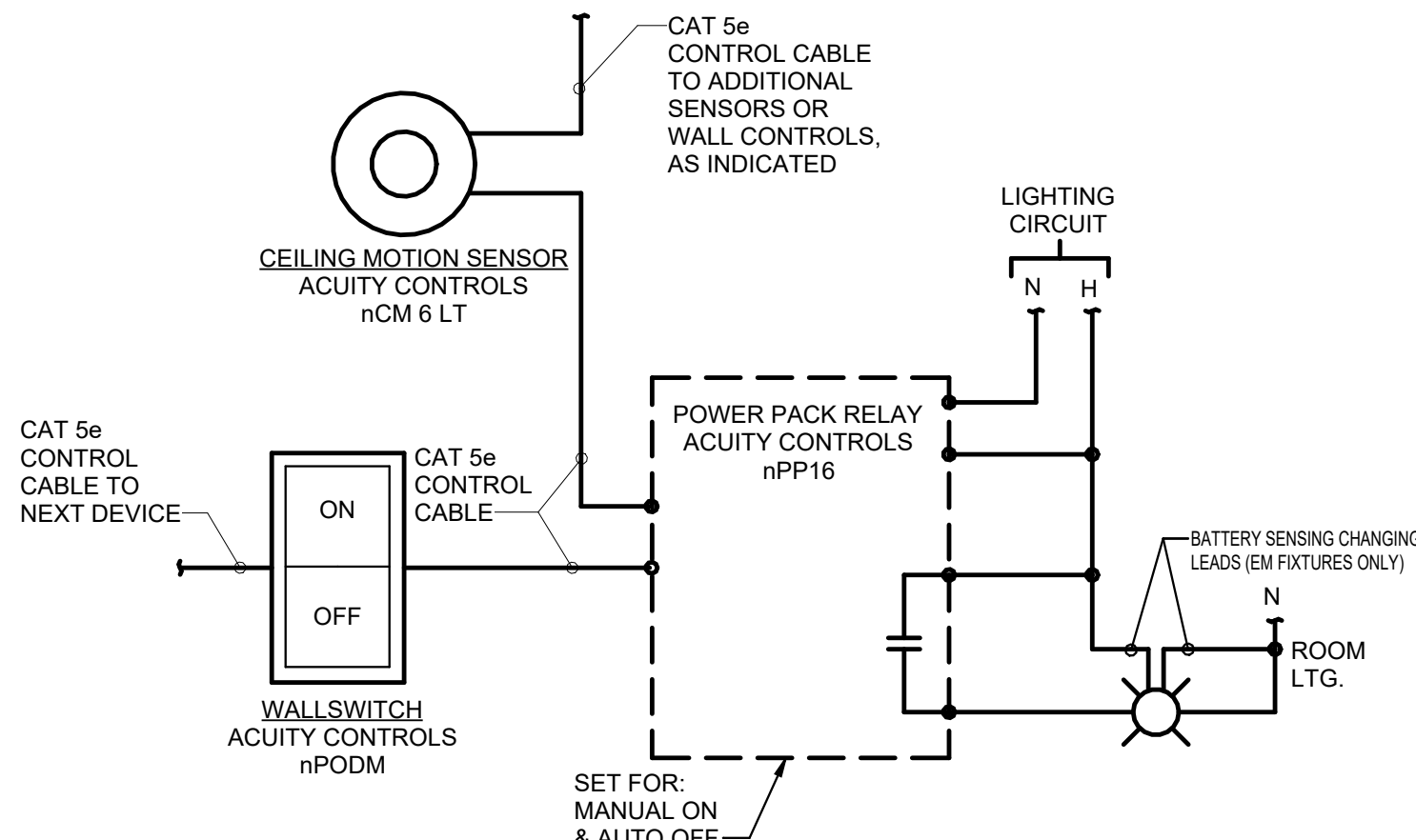
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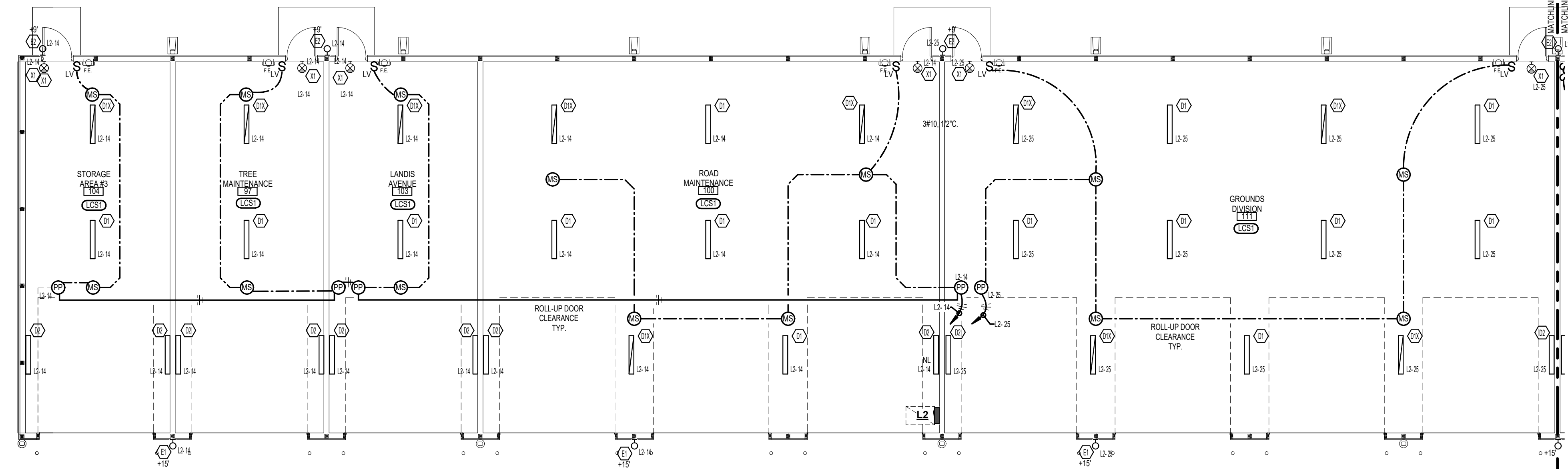
1 LIGHTING PLAN - BUILDING B
SCALE: 1/8" = 1'-0"



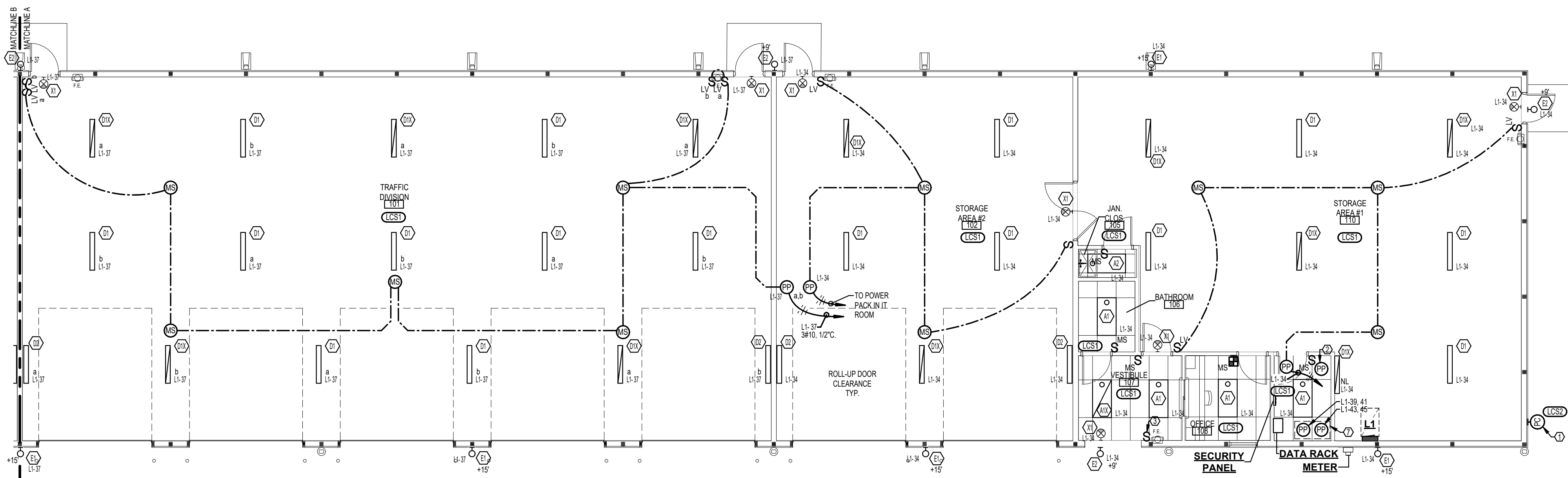
LIGHTING CONTROLS BASED ON ACUTY CONTROLS nLIGHT SYSTEM.
PROVIDE nLIGHT OR APPROVED SIMILAR.

4 LOW VOLTAGE SWITCH & MOTION SENSOR
SCALE: NONE

LIGHTING CONTROL SCHEME SCHEDULE	
SCHEME	DESCRIPTION
LC51	LUMINAIRE CONTROL SHALL BE BY LOCAL DEVICES. LUMINAIRES SHALL BE MANUAL ON/OFF VIA SWITCHES AND AUTO OFF VIA OCCUPANCY SENSORS AFTER THE SPACE HAS BEEN VACANT FOR A PERIOD OF TIME. EMERGENCY LIGHTS SHALL TURN ON WHEN NORMAL POWER TO ROOM LIGHTING FIXTURES FAIL.
LC52	LUMINAIRE CONTROL SHALL BE BY PHOTOCELL. IT SHALL TURN OFF ALL EXTERIOR LIGHTING WHEN SUFFICIENT DAYLIGHT IS AVAILABLE.



2 LIGHTING PLAN - BUILDING A AREA B
SCALE: 1/8" = 1'-0"



3 LIGHTING PLAN - BUILDING A AREA A
SCALE: 1/8" = 1'-0"

LIGHTING FIXTURE SCHEDULE

TYPE	DESCRIPTION	MANUFACTURER	SERIES	LAMP			BALLAST / DRIVER	VOLTAGE	MOUNTING
				TYPE	NO.	LUMENS	WATTS		
A1	2'x4' RECESSED DIMMABLE LED EDGE LIT FLAT PANEL FIXTURE, WITH WHITE ALUMINUM BEZEL ON STEEL BACK PLATE WITH GRID LOCKING CLIPS AND WHITE FROSTED SCRATCH AND IMPACT RESISTANT ACRYLIC LENS.	LITHONIA	EPANL-2x4-4800LM-80CRI-35K-MIN1-MVOLT	LED 3500K	--	5119	45W	0-10V, DIMMING TO 1%	120/277V
A1X	SAME AS 'TYPE A1' EXCEPT WITH EMERGENCY BATTERY PACK.	LITHONIA	EPANL-2x4-4800LM-80CRI-35K-MIN1-MVOLT-E10WCP	LED 3500K	--	5119	45W	0-10V, DIMMING TO 1%	120/277V
A2	2'x4' RECESSED DIMMABLE LED EDGE LIT FLAT PANEL FIXTURE, WITH WHITE ALUMINUM BEZEL ON STEEL BACK PLATE WITH GRID LOCKING CLIPS AND WHITE FROSTED SCRATCH AND IMPACT RESISTANT ACRYLIC LENS.	LITHONIA	EPANL-2x4-4000LM-80CRI-35K-MIN1-MVOLT	LED 3500K	--	4240	38W	0-10V, DIMMING TO 1%	120/277V
D1	4'L LINEAR LED, ACRYLIC LENSE, STRIP LIGHTING FIXTURE WITH WHITE STEEL HOUSING, COLD WEATHER DRIVER AND WIDE DISTRIBUTION REFLECTOR.	LITHONIA	CLX-L48-9000LM-SEF-WDL-MVOLT-G21-LUGR-35K-80CRI-WH	LED 3500K	--	9000	70W	0-10V, DIMMING TO 1%	120/277V
D1X	SAME AS 'TYPE D' EXCEPT WITH EMERGENCY BATTERY PACK.	LITHONIA	CLX-L48-9000LM-SEF-WDL-MVOLT-G21-LUGR-35K-80CR-WH-PS1050	LED 3500K	--	9000	70W	0-10V, DIMMING TO 1%	120/277V
D2	4'L LINEAR LED, ACRYLIC LENSE, STRIP LIGHTING FIXTURE WITH WHITE STEEL HOUSING, COLD WEATHER DRIVER AND FLAT DISTRIBUTION REFLECTOR.	LITHONIA	CLX-L48-9000LM-SEF-FDL-MVOLT-G21-LUGR-35K-80CRI-WH	LED 3500K	--	9000	70W	0-10V, DIMMING TO 1%	120/277V
E1	9" x 18" ARCHITECTURAL WALL SCNCE, ALUMINUM HOUSING, DARK BRONZE POWDER COAT FINISH, ACRYLIC LENS. WITH EMERGENCY BATTERY PACK AND MOTION SENSOR.	LITHONIA	WDGE3-LED-P2-40K-80CRI-R4-MVOLT-SRM-PIRH-DOBXD	LED 4000K	--	8779	15W	0-10V, DIMMING TO 1%	120/277V
E2	9" x 11.5" ARCHITECTURAL WALL SCNCE, ALUMINUM HOUSING, DARK BRONZE POWDER COAT FINISH, ACRYLIC LENS. WITH EMERGENCY BATTERY PACK AND MOTION SENSOR.	LITHONIA	WDGE2-LED-P2-40K-80CRI-T4M-MVOLT-SRM-E20WC-DMG-PIR-DOBXD	LED 4000K	--	2000	4W	0-10V, DIMMING TO 1%	120/277V
S1	SITE LIGHTING POLE WITH NUMBER OF LIGHT HEAD AS SHOWN ON CIVIL DRAWINGS. COORDINATE REQUIREMENTS WITH CIVIL DRAWINGS.	LITHONIA	DSX0-LED-P6-40K-TFTM-MVOLT-SPA-PIRH-DBLXD	LED 4000K	--	17511	238	--	208V
X1	SINGLE SIDED EXIT LIGHT WITH RED STENCIL LETTERS ON WHITE ALUMINUM HOUSING. WITH EMERGENCY BATTERY PACK.	LITHONIA	LQM-S-W-3-R-120/277-ELN	--	--	--	1.5	--	120/277V

NOTE:
ELECTRICAL DRAWINGS

This work will be performed by the owner.
Successful contractor will need to coordinate their work with the owner's workforce.
This information is supplied for information only.

12" 0 5' 10' 15'
SCALE: 1/8"=1'-0"

RELEASE / REVISION

No.	Date	Description

GENERAL NOTES:

- REFER TO SHEET E01 FOR GENERAL NOTES AND ADDITIONAL INFORMATION.
- POWER PACKS SHALL BE LOCATED IN THE CEILING AT THE ACCESS PANEL.
- ALL "01" LIGHT FIXTURES SHALL BE MOUNTED TO BOTTOM OF TRUSS UNLESS STATED OTHERWISE. PROVIDE SUPPORT BRACKET SPANNING BETWEEN TRUSSES ABOVE CEILING TO ATTACH FIXTURE.
- ALL "02" LIGHT FIXTURES SHALL BE WALL MOUNTED AT 14" A.F.F. UNLESS STATED OTHERWISE.
- ALL EMERGENCY FIXTURES SHALL HAVE AN UNSWITCHED HOT WIRE FOR BATTERY SENSING CHANGING LEADS.
- ALL LIGHT FIXTURES CONNECTED TO CIRCUIT L1-S9 AND L2-14 SHALL USE 3WFS 100'S.
- ALL CEILING MOUNTED MOTION SENSORS SHALL BE HIGH CEILING TYPE AND RATED FOR COLD WEATHER, UNLESS STATED OTHERWISE.

KEYNOTES

- LOCATE PHOTOCELL NEAR OVERHANG. ADJUST SO NOT AFFECTED BY ARTIFICIAL LIGHT AND VEHICLE HEADLIGHTS. PHOTOCELL SHALL CONTROL ALL BUILDING A MOUNTED EXTERIOR LIGHTS.
- POWER PACK FOR ALL BUILDING A EXTERIOR LIGHTS.
- LIGHT SWITCH FOR ALL BUILDING A EXTERIOR LIGHTS.
- POWER PACK FOR ALL BUILDING B EXTERIOR LIGHTS.
- LIGHT SWITCH FOR ALL BUILDING B EXTERIOR LIGHTS.
- LOCATE PHOTOCELL NEAR OVERHANG. ADJUST SO NOT AFFECTED BY ARTIFICIAL LIGHT AND VEHICLE HEADLIGHTS. PHOTOCELL SHALL CONTROL ALL BUILDING B MOUNTED EXTERIOR LIGHTS.
- POWER PACK FOR SITE LIGHTING. CONNECT TO BUILDING PHOTO CELL.



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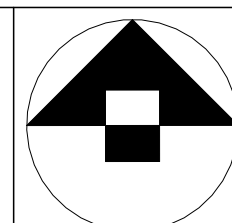
David G. Manders AIA AI-07220
Lawrence J. Merighi AIA AI-07473
Ronald P. Portadin AIA AI-13038
Peter W. Farrell AIA AI-13618

Project

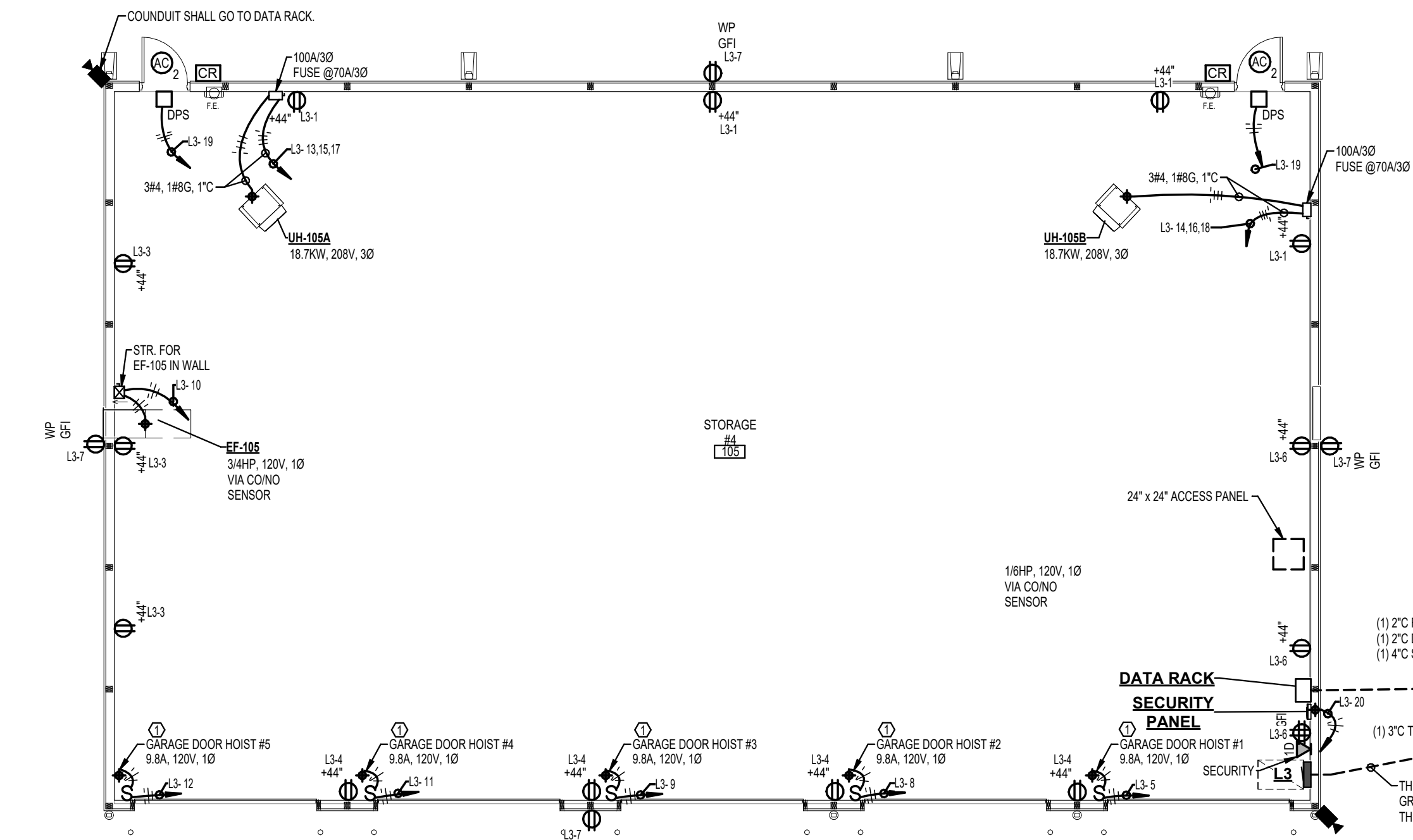
NEW POLE BARN FOR CITY
OF VINELAND PUBLIC
WORKS

Drawing

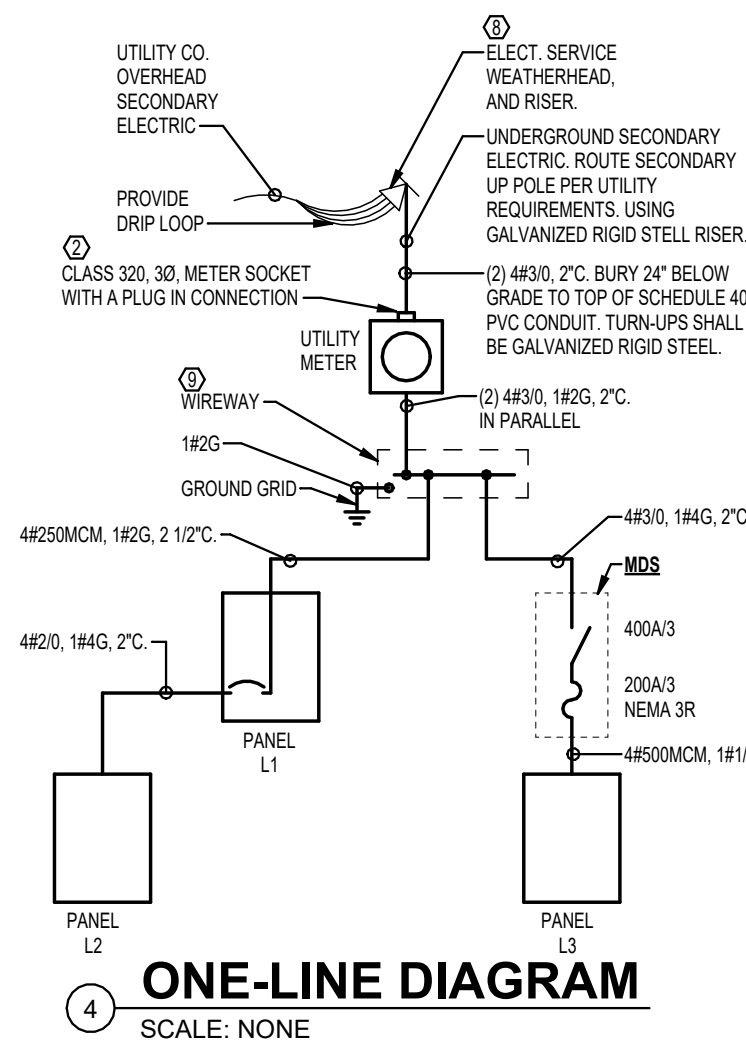
LIGHTING PLANS, AND
LIGHTING SCHEDULES



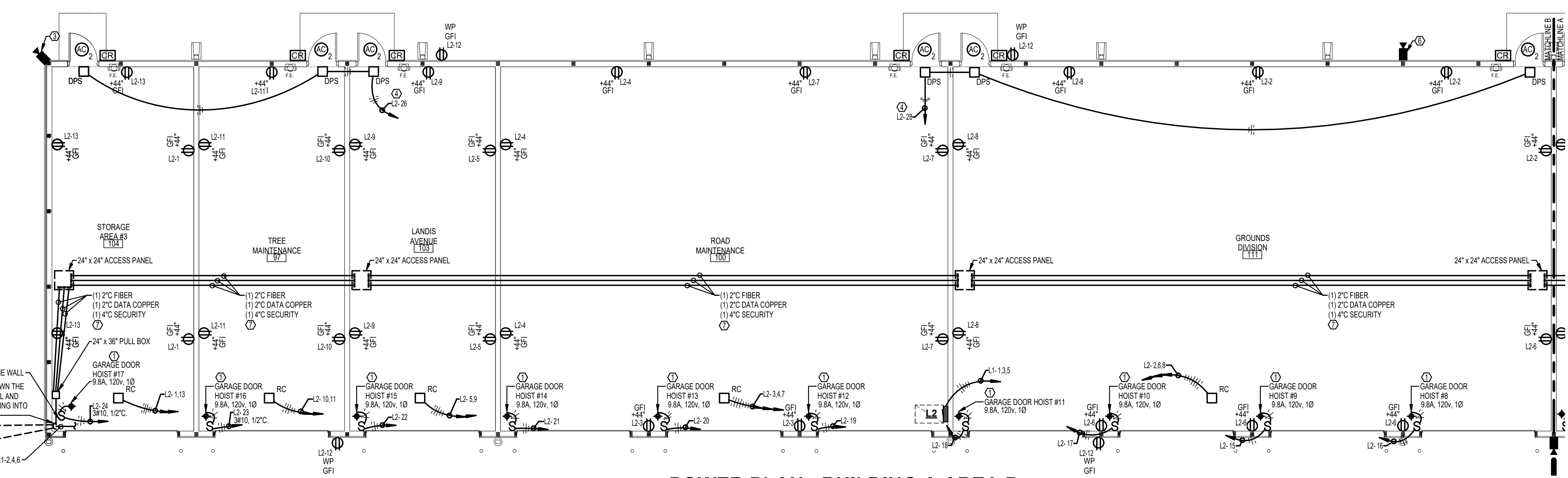
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Drawn	Date	
KA	10/08/2024	



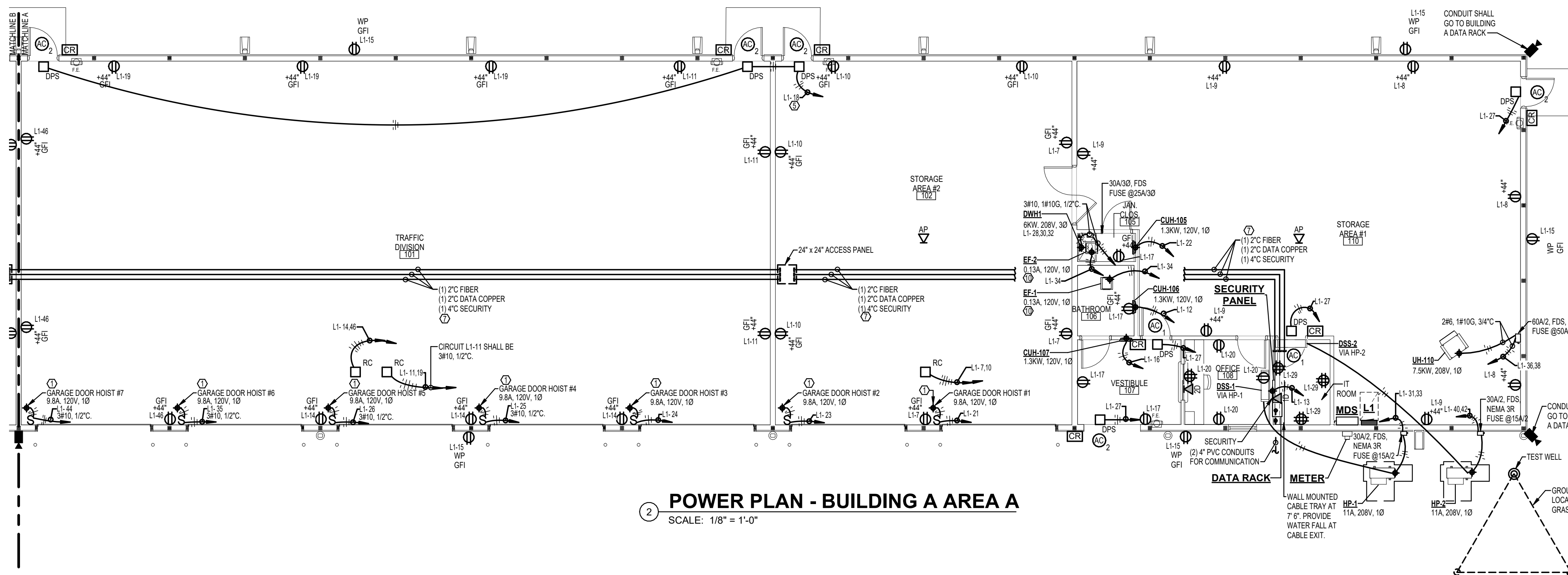
3 POWER PLAN - BUILDING B
SCALE: 1/8" = 1'-0"



4 ONE-LINE DIAGRAM
SCALE: NONE



1 POWER PLAN - BUILDING A AREA B
SCALE: 1/8" = 1'-0"



2 POWER PLAN - BUILDING A AREA A
SCALE: 1/8" = 1'-0"

Branch Panel: L1										
Location: STORAGE AREA #1 110					Volts: 120/208 Wye			Mains Type: Main Circuit Breakers		
Supply From:					Phases: 3			Mains Rating: 250 A		
Mounting: Surface					Wires: 4					
Enclosure:					A.I.C. Rating: 22KAIC					
Notes:										
CKT	Circuit Description	Trip	Poles	A	B	C	Poles	Trip	Circuit Description	CKT
1	L2	125 A	3	7301...	--		3	--	L2 Breaker Space	2
3	--	--	--		7304...	--	--	--		4
5	--	--	--			7304...	--	--		6
7	Receptacle STORAGE AREA #2 102	20 A	1	600 VA/ 600 VA			1	20 A	Receptacle STORAGE AREA #1 110	8
9	Receptacle STORAGE AREA #1 110	20 A	1		800 VA/ 800 VA		1	20 A	Receptacle STORAGE AREA #2 102	10
11	Receptacle TRAFFIC DIVISION 101	20 A	1			600 VA/ 1260...	1	20 A	CUH-106	12
13	Security and Comm.	20 A	1	400 VA/ 600 VA			1	20 A	Receptacle TRAFFIC DIVISION 101	14
15	Receptacle STORAGE AREA #1 110	20 A	1		1000... 1260...		1	20 A	CUH-107	16
17	Receptacle VESTIBULE 107	20 A	1			800 VA/ 600 VA	1	20 A	Door Controls	18
19	Receptacle TRAFFIC DIVISION 101	20 A	1	600 VA/ 1000...			1	20 A	Receptacle OFFICE	20
21	Garage Door #1	20 A	1		1176... 1260...		1	20 A	CUH-105	22
23	Garage Door #2	20 A	1			1176... 1176...	1	20 A	Garage Door #3	24
25	Garage Door #4	20 A	1	1176... 1176...			1	20 A	Garage Door #5	26
27	Door Controls	20 A	1		800 VA/ 2000...		3	25 A	DWH1	28
29	Receptacle IT ROOM	20 A	1			1200... 2000...	--	--		30
31	HP-1 and DSS-1	20 A	2	1982... 2000...			--	--		32
33	--	--	--		1982... 972 VA		1	20 A	Lighting BUILDING A AREA A EAST...	34
35	Garage Door #6	20 A	1			1176... 3750...	2	50 A	UH-110	36
37	Lighting BUILDING A AREA A WEST...	20 A	1	707 VA/ 3750...			--	--		38
39	Lighting OFFICE BUILDING LOT	20 A	2	--	952 VA/ 1982...		2	20 A	HP-2 and DSS-2	40
41	--	--	--			952 VA/ 1982...	--	--		42
43	Lighting POLE BARN LOT	20 A	2	1190... 1176...			1	20 A	Garage Door #7	44
45	--	--	--		1190... 600 VA		1	20 A	Receptacle TRAFFIC DIVISION 101	46
47	Spare	20 A	1			0 VA/ 0 VA	1	20 A	Spare	48
49	Spare	20 A	1	0 VA/ 0 VA			1	20 A	Spare	50
51	Spare	20 A	1		0 VA/ 0 VA		1	20 A	Spare	52
53	Spare	20 A	1			0 VA/ 0 VA	1	20 A	Spare	54
55	Spare	20 A	1	0 VA/ 0 VA			1	20 A	Spare	56
57	Spare	20 A	1		0 VA/ 0 VA		1	20 A	Spare	58
59	Spare	20 A	1			0 VA/ 0 VA	1	20 A	Spare	60
Total Load:		24258 VA		24077 VA		23976 VA				
Total Amps:		202 A		201 A		200 A				
Legend:										
Panel Totals										
Total Conn. Load: 72310 VA										
Total Est. Demand: 64946 VA										
Total Conn. Current: 201 A										
Total Est. Demand... 180 A										

Branch Panel: L2										
Location: ROAD MAINTENANCE 100					Volts: 120/208 Vye			Mains Type: Main Lugs Only		
Supply From: L1					Phases: 3			Mains Rating: 125 A		
Mounting: Surface					Wires: 4					
Enclosure:					A.I.C. Rating: 10KAIC					
Notes:										
CKT	Circuit Description	Trip	Poles	A	B	C	Poles	Trip	Circuit Description	CKT
1	Receptacle STORAGE AREA #3 104	20 A	1	400 VA/ 600 VA			1	20 A	Receptacle GROUNDS DIVISION 111	2
3	Receptacle ROAD MAINTENANCE 100	20 A	1		400 VA/ 600 VA		1	20 A	Receptacle ROAD MAINTENANCE 100	4
5	Receptacle LANDIS AVENUE 103	20 A	1			400 VA/ 800 VA	1	20 A	Receptacle GROUNDS DIVISION 111	6
7	Receptacle ROAD MAINTENANCE 100	20 A	1	600 VA/ 600 VA			1	20 A	Receptacle GROUNDS DIVISION 111	8
9	Receptacle LANDIS AVENUE 103	20 A	1		600 VA/ 400 VA		1	20 A	Receptacle TREE MAINTENANCE 97	10
11	Receptacle TREE MAINTENANCE 97	20 A	1			600 VA/ 800 VA	1	20 A	Receptacle ROAD MAINTENANCE 100	12
13	Receptacle STORAGE AREA #3 104	20 A	1	600 VA/ 974 VA			1	20 A	Lighting BUILDING A AREA B	14
15	Garage Door #9	20 A	1		1176... 1176...		1	20 A	Garage Door #8	16
17	Garage Door #10	20 A	1			1176... 1176...	1	20 A	Garage Door #11	18
19	Garage Door #12	20 A	1	1176... 1176...			1	20 A	Garage Door #13	20
21	Garage Door #14	20 A	1		1176... 1176...		1	20 A	Garage Door #15	22
23	Garage Door #16	20 A	1			1176... 1176...	1	20 A	Garage Door #17	24
25	Lighting BUILDING A AREA B	20 A	1	575 VA/ 600 VA			1	20 A	Door Controls West Side	26
27	Spare	20 A	1		0 VA/ 600 VA		1	20 A	Door Controls East Side	28
29	Spare	20 A	1			0 VA/ 0 VA	1	20 A	Spare	30
31	Spare	20 A	1	0 VA/ 0 VA			1	20 A	Spare	32
33	Spare	20 A	1		0 VA/ 0 VA		1	20 A	Spare	34
35	Spare	20 A	1			0 VA/ 0 VA	1	20 A	Spare	36
37	Spare	20 A	1	0 VA/ 0 VA			1	20 A	Spare	38
39	Spare	20 A	1		0 VA/ 0 VA		1	20 A	Spare	40
41	Spare	20 A	1			0 VA/ 0 VA	1	20 A	Spare	42
Total Load:		7301 VA		7304 VA		7304 VA				
Total Amps:		61 A		61 A		61 A				
Legend:										
Panel Totals										
Total Conn. Load: 21909 VA										
Total Est. Demand: 20733 VA										
Total Conn. Current: 61 A										
Total Est. Demand: 58 A										

Branch Panel: L3										
Location: STORAGE #4 105					Volts: 120/208 Wye			Mains Type: Main Circuit Breakers		
Supply From:					Phases: 3			Mains Rating: 200 A		
Mounting: Surface					Wires: 4					
Enclosure:					A.I.C. Rating: 10KAIC					
Notes:										
CKT	Circuit Description	Trip	Poles	A	B	C	Poles	Trip	Circuit Description	CKT
1	Receptacle NORHT WALL	20 A	1	800 VA/ 707 VA			1	20 A	Lighting BUILDING B	2
3	Receptacle WEST WALL	20 A	1		600 VA/ 800 VA		1	20 A	Receptacle SOUTH WALL	4
5	Garage Door #1	20 A	1			1176... 800 VA	1	20 A	Receptacle EAST WALL	6
7	Receptacle OUTSIDE WALLS	20 A	1	800 VA/ 1176...			1	20 A	Garage Door #2	8
9	Garage Door #3	20 A	1		1176... 1656...		1	20 A	EF-105	10
11	Garage Door #4	20 A	1			1176... 1176...	1	20 A	Garage Door #5	12
13	UH-105A	70 A	3	6725... 6725...			3	70 A	UH-105B	14
15	--	--	--		6725... 6725...		--	--		16
17	--	--	--			6725... 6725...	--	--		18
19	Door Controls	20 A	1	400 VA/ 400 VA			1	20 A	Data and Security	20
21	Spare	20 A	1		0 VA/ 0 VA		1	20 A	Spare	22
23	Spare	20 A	1		0 VA/ 0 VA	0 VA/ 0 VA	1	20 A	Spare	24
25	Spare	20 A	1	0 VA/ 0 VA			1	20 A	Spare	26
27	Spare	20 A	1		0 VA/ 0 VA		1	20 A	Spare	28
29	Spare	20 A	1			0 VA/ 0 VA	1	20 A	Spare	30
31	Spare	20 A	1	0 VA/ 0 VA			1	20 A	Spare	32
33	Spare	20 A	1		0 VA/ 0 VA		1	20 A	Spare	34
35	Spare	20 A	1			0 VA/ 0 VA	1	20 A	Spare	36
37	Spare	20 A	1	0 VA/ 0 VA			1	20 A	Spare	38
39	Spare	20 A	1		0 VA/ 0 VA		1	20 A	Spare	40
41	Spare	20 A	1			0 VA/ 0 VA	1	20 A	Spare	42
Total Load:		17732 VA		17681 VA		17777 VA				
Total Amps:		148 A		147 A		148 A				
Legend:										
Panel Totals										
Total Conn. Load:									53191 VA	
Total Est. Demand:									52272 VA	
Total Conn. Current:									148 A	
Total Est. Demand...									145 A	

NOTE:
ELECTRICAL DRAWINGS
This work will be performed by the owner.
Successful contractor will need to coordinate
their work with the owner's workforce.
This information is supplied for information only.

12" 0' 5' 10' 15'
SCALE: 1/8"=1'-0"

RELEASE / REVISION

No.	Date	Description

GENERAL NOTES:

- REFER TO SHEET E01 FOR GENERAL NOTES AND ADDITIONAL INFORMATION.
- PROVIDE ALL REQUIRED WIRING, RACEWAYS, AND POWER FOR SECURITY CAMERAS, AND ACCESS CONTROL SYSTEMS, INCLUDING ALL TERMINATIONS. COORDINATE REQUIREMENTS WITH OWNERS SECURITY VENDOR AND DOOR HARDWARE PROVIDER.
- COORDINATE LOCATION OF COMMUNICATION CONDUITS WITHIN BUILDING WITH DUCTWORK.
- DATA OUTLETS MOUNTED NEXT TO RECEPTABLES SHALL BE MOUNTED AT THE SAME HEIGHT AS THE RECEPTABLE.

KEYNOTES

- CEILING MOUNTED GARAGE DOOR HOST, VERIFY EXACT LOCATION.
- CLASS 320 METER SOCKET WITH THE FOLLOWING SPECIFICATIONS: UL APPROVED, 335 AMPERE CONTINUOUS RATING, 40 AMPERE MAXIMUM, JAW CLAMPING AND BYPASS LEVER, 8TH JAW IN 9 O'CLOCK POSITION, PROPER LUG CONNECTORS FOR THE SERVICE CONDUCTORS, BARREL LOCK PROVISION, HAS TO ACCEPT PADLOCK AND METER SEAL, SOCKET STYLE NOT BOLT ON, METER BASE AND SOCKET SHALL MEET SPECIFICATIONS OF UTILITY COMPANY.
- CONDUIT SHALL GO TO NEAREST ACCESS POINT, THEN THROUGH UNDERGROUND CONDUIT TO BUILDING B DATA RACK.
- ALL CONDUITS SHALL GO TO NEAREST ACCESS POINT AND DIVERGE FROM THERE. ACCESS CONTROL SHALL GO TO BUILDING B SECURITY PANEL.
- ALL CONDUITS SHALL GO TO NEAREST ACCESS POINT AND DIVERGE FROM THERE. ACCESS CONTROL SHALL GO TO BUILDING A SECURITY PANEL.
- CONDUIT SHALL GO TO NEAREST ACCESS POINT, THEN TO BUILDING A DATA RACK.
- MAIN CONDUIT PATH FOR ALL CIRCUITS AND RACEWAYS TO FOLLOW.
- CONTRACTOR SHALL INSTALL SECONDARY RISER ON STANDOFFS AND PROVIDE CONDUITS TO SECONDARY CONDUIT POINT AND DIVERGE FROM THERE. WEATHER HEAD SHALL BE INSTALLED 6" BELOW THE NEUTRAL. COORDINATE ALL REQUIREMENTS WITH UTILITY COMPANY.
- PROVIDE NEUTRAL BAR IN WIREWAY.
- CONTROL VIA ROOM LIGHT SWITCH.

BCCLT

CONSULTING ENGINEERS

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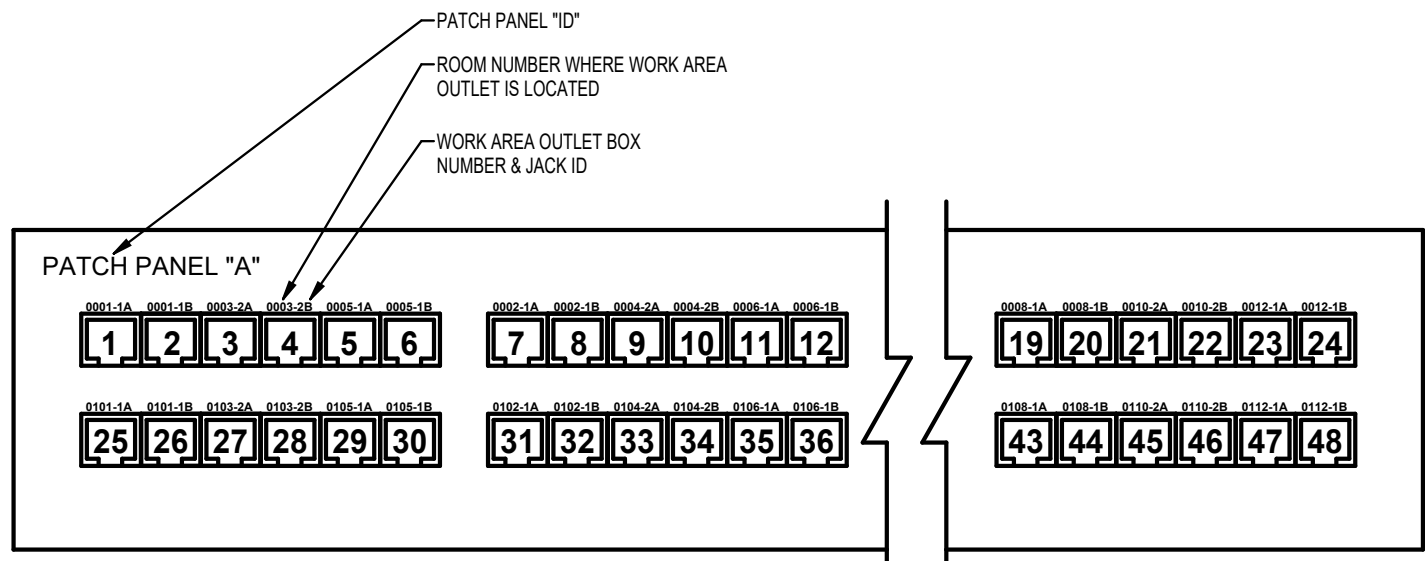
mmpf

architects

Manders Merighi Portadin Farrell Architects, LLC

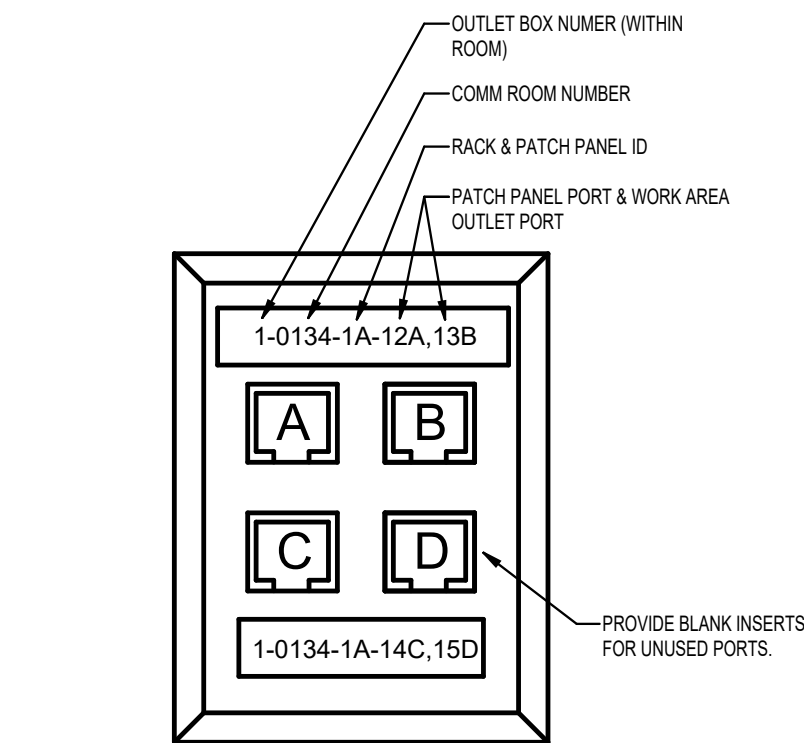
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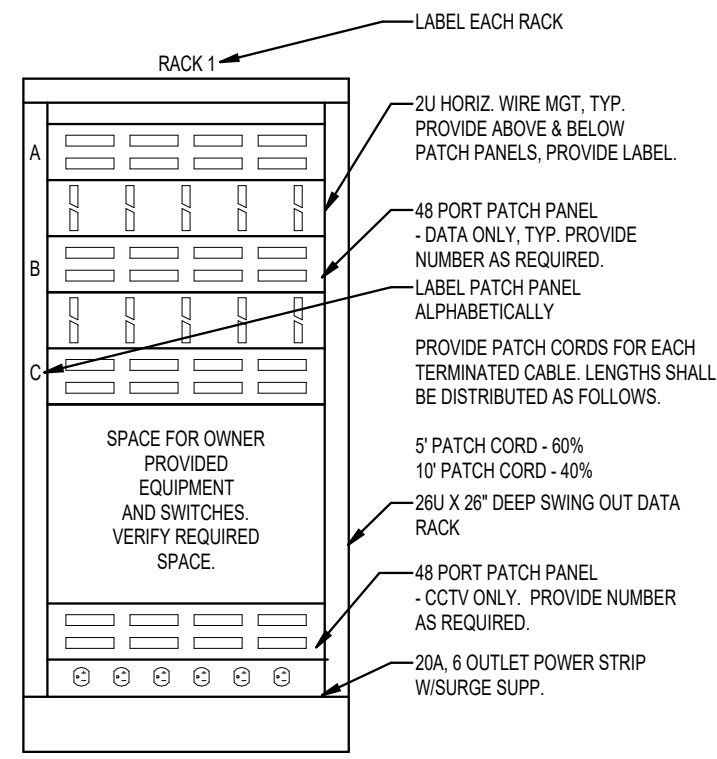
NOTE:
REFER TO PROJECT SPECIFICATIONS FOR ADDITIONAL LABELING REQUIREMENTS FOR
STRUCTURED VOICE & DATA CABLING SYSTEMS.

1 **TYPICAL PATCH PANEL LABELING**
SCALE: NONE

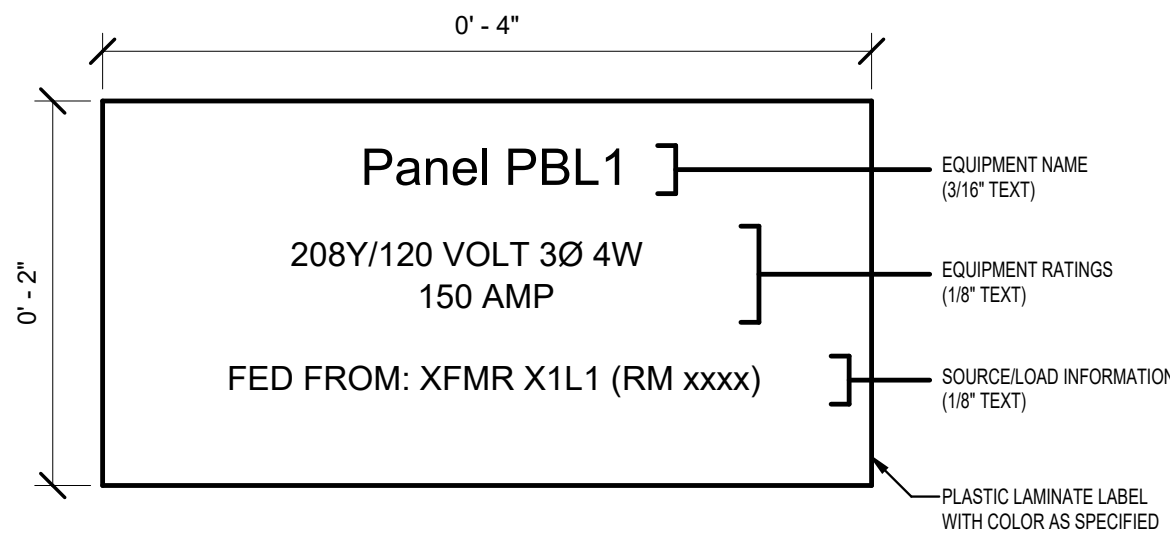


- JACK (PORT) ID SHALL BE "A", "B", "C", "D" GOING FROM LEFT-TO-RIGHT AND TOP-TO-BOTTOM.
- REFER TO PROJECT SPECIFICATIONS FOR ADDITIONAL LABELING REQUIREMENTS FOR STRUCTURED VOICE & DATA CABLING SYSTEMS.

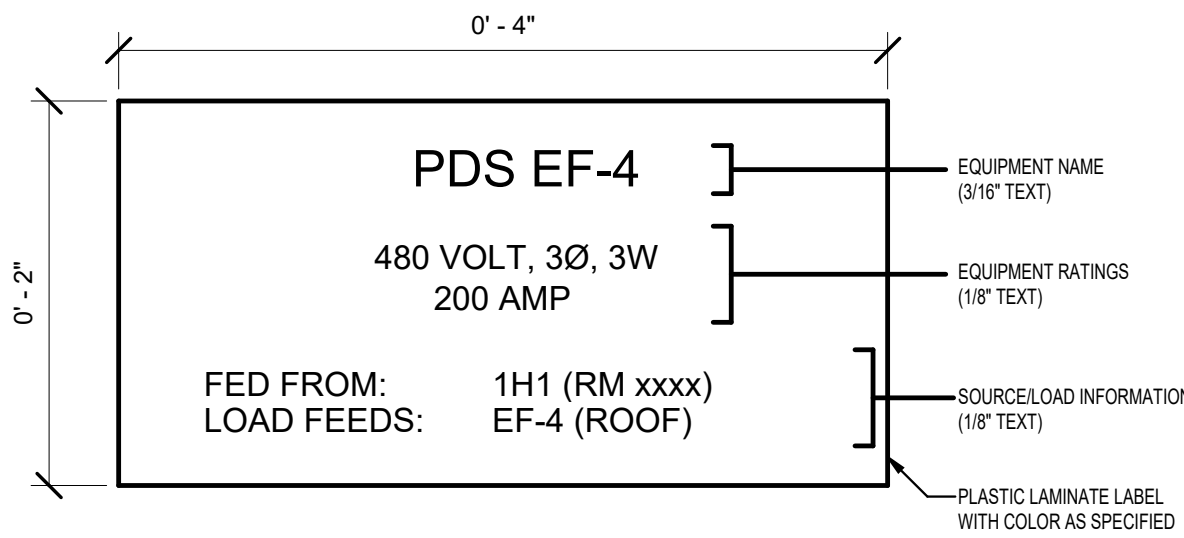
2 **TYPICAL WORK AREA OUTLET LABELING**
SCALE: NONE



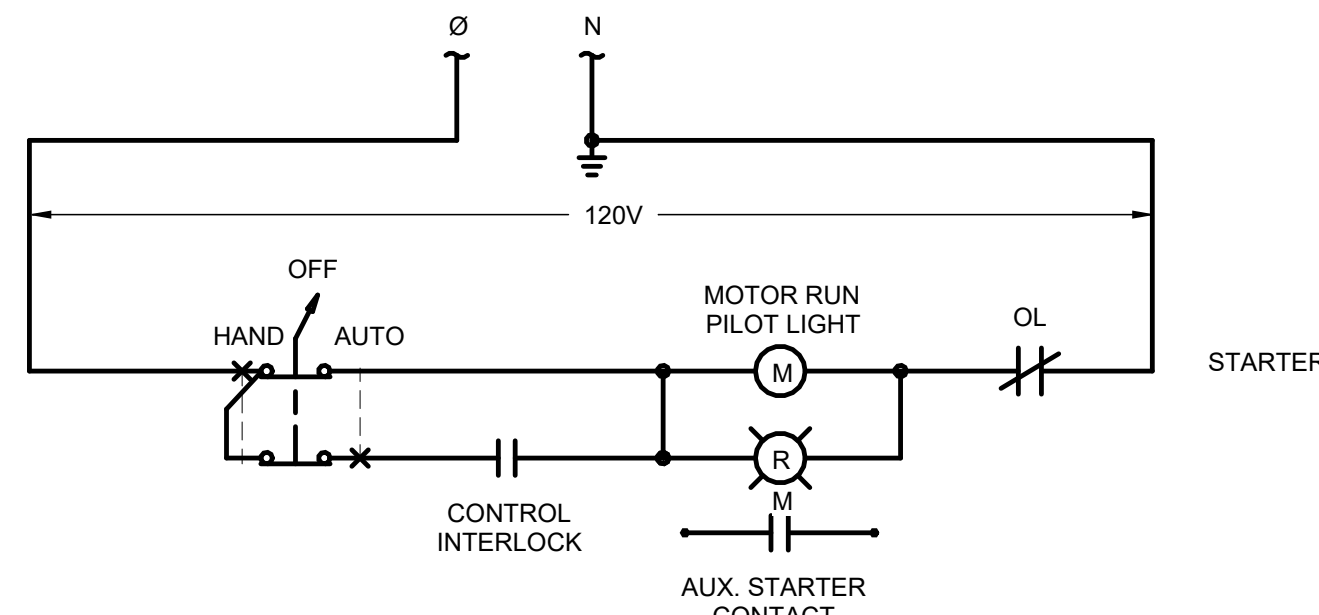
5 **TYPICAL TELECOM RACK ELEVATION**
SCALE: NONE



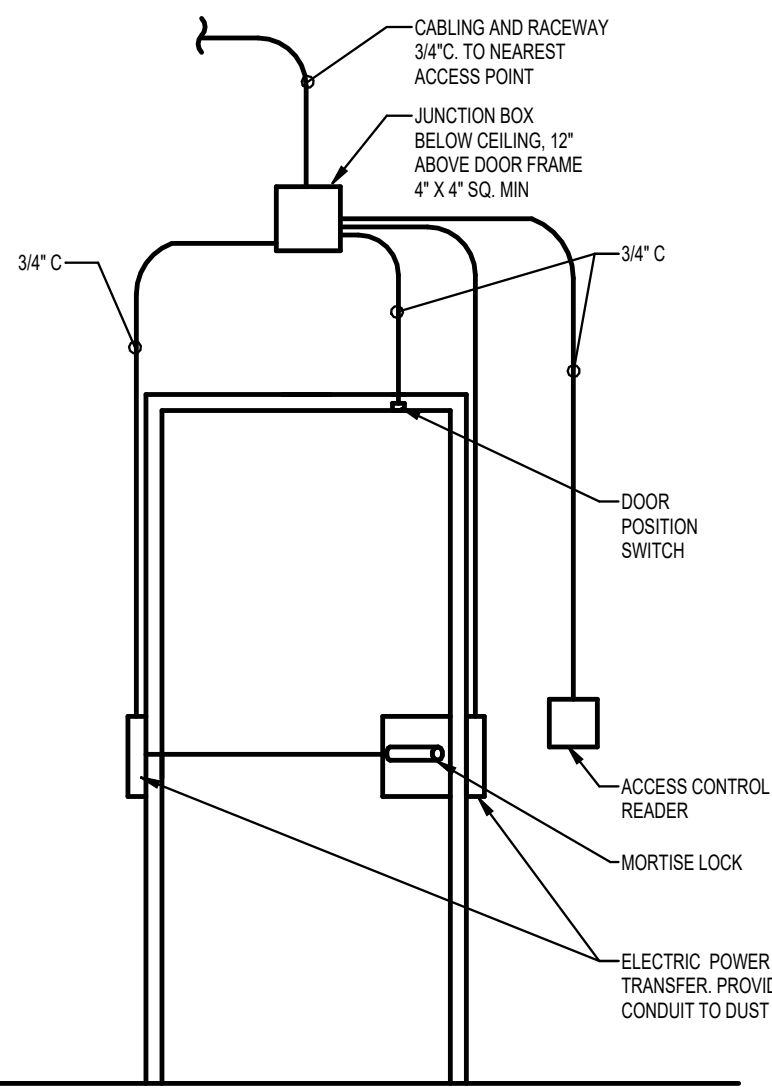
3 **ELECTRICAL EQUIPMENT LABEL**
SCALE: NONE



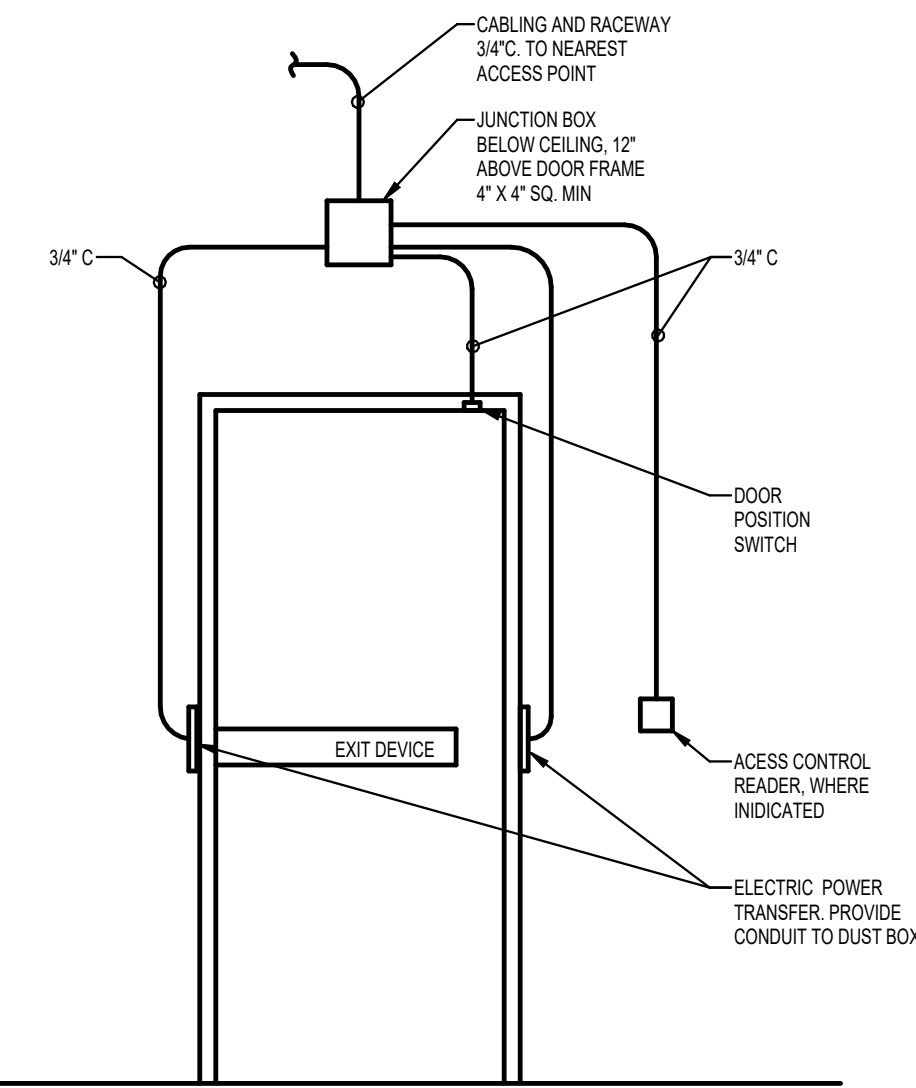
4 **ELECTRICAL EQUIPMENT LABEL - REMOTE LOAD**
SCALE: NONE



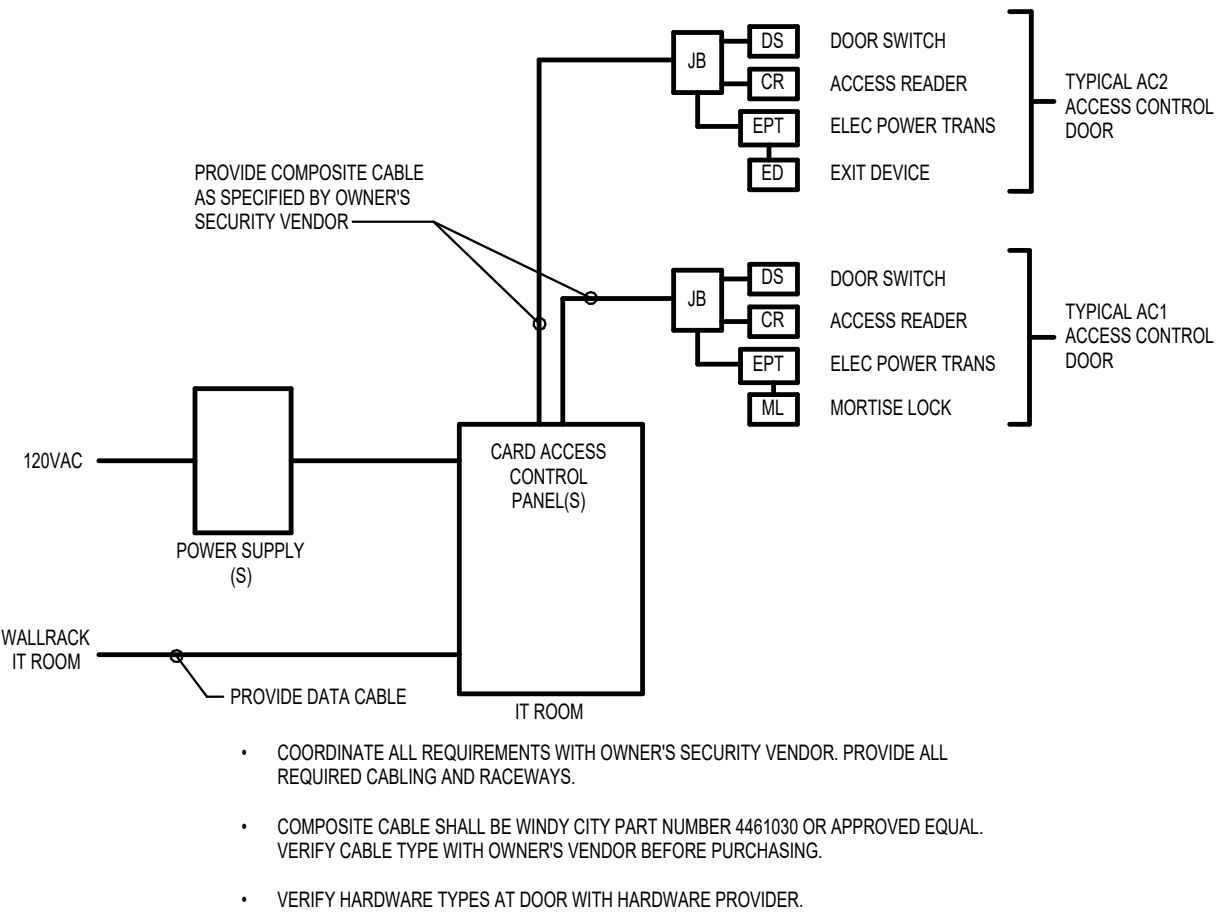
11 **CONTROL WIRING DIAGRAM #1**
SCALE: NONE



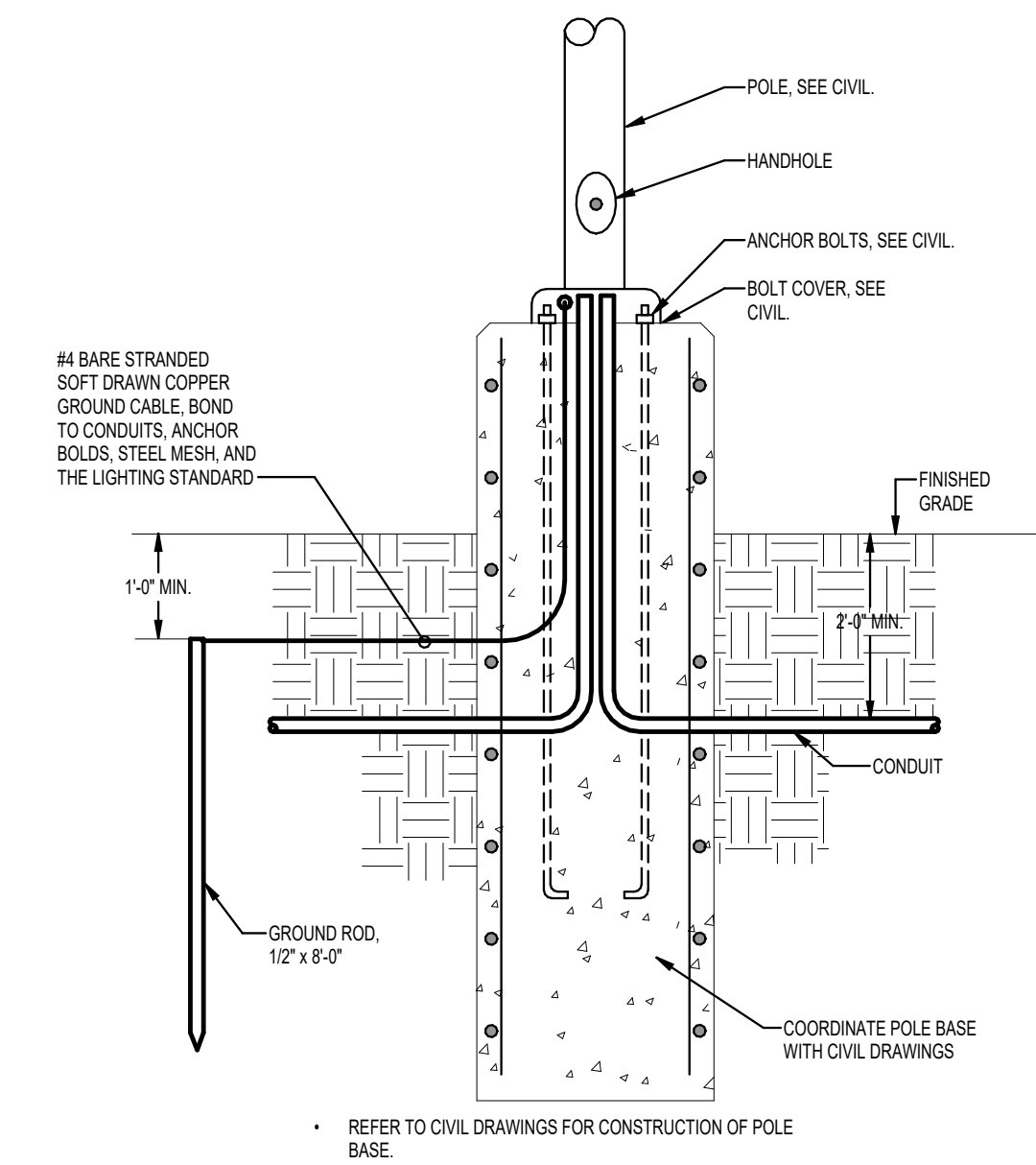
8 **TYPE AC1 ACCESS CONTROL RACEWAY DIAGRAM**
SCALE: NONE



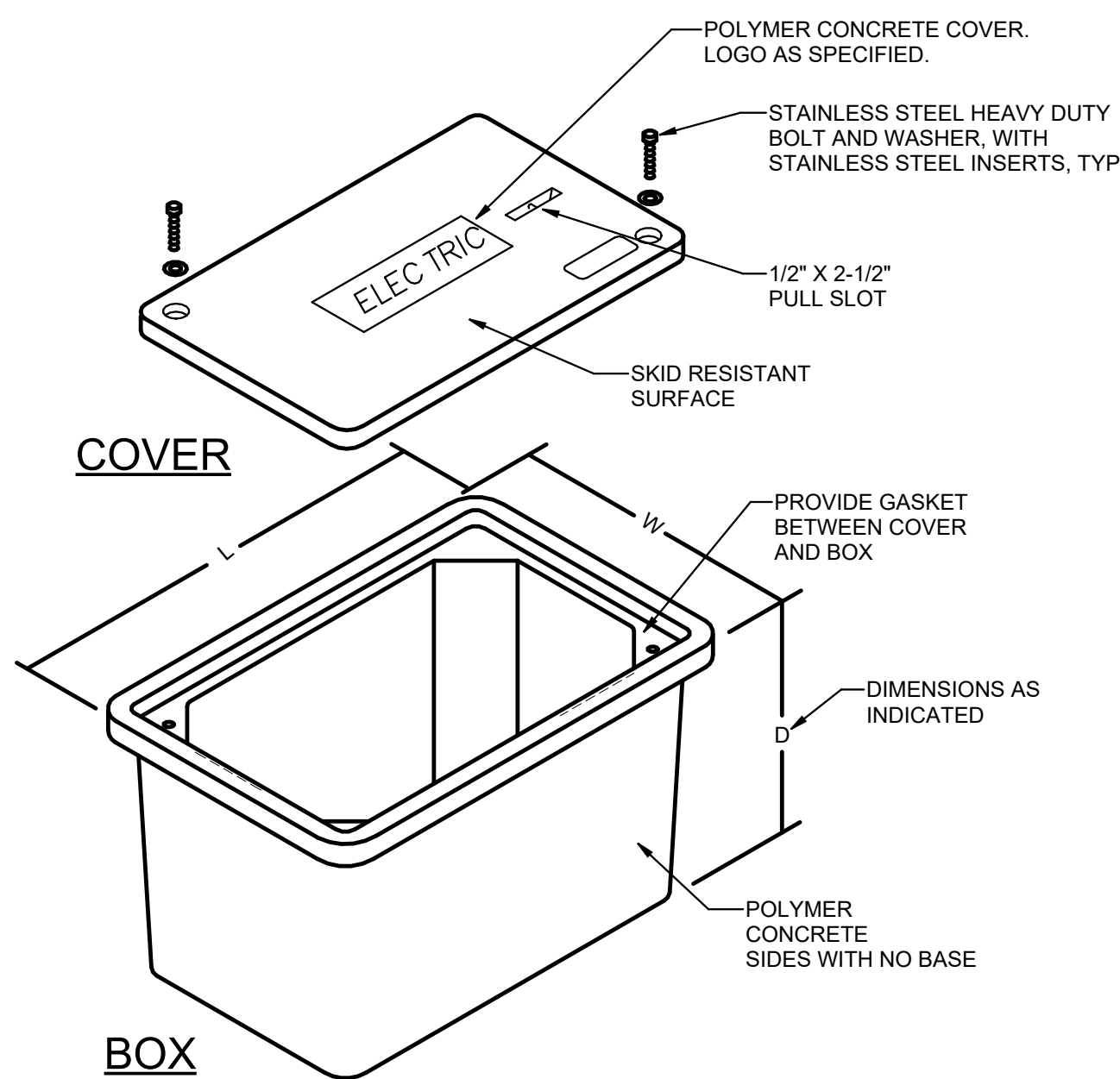
9 **TYPE AC2 ACCESS CONTROL RACEWAY DIAGRAM**
SCALE: NONE



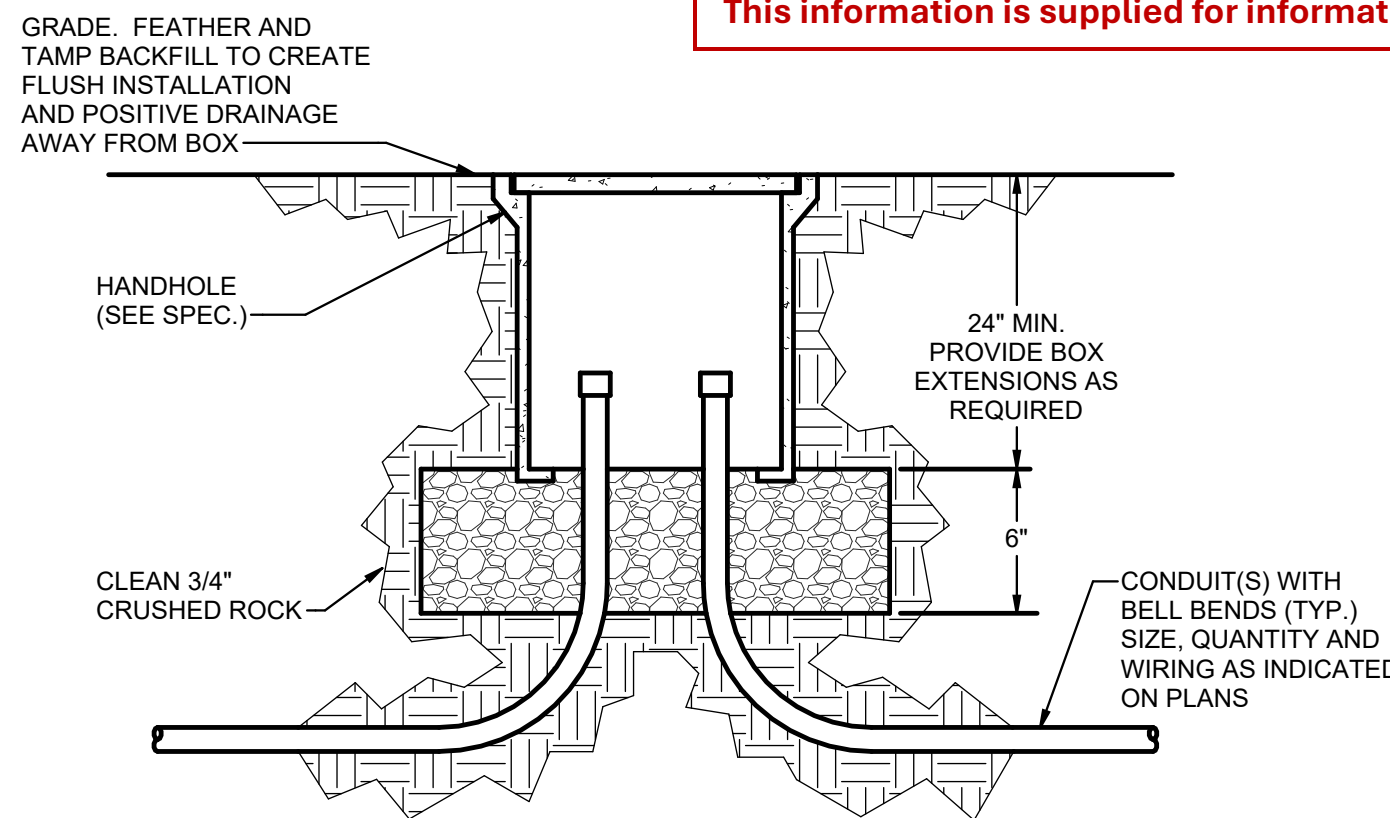
10 **DOOR ACCESS CONTROL SYSTEM WIRING DIAGRAM**
SCALE: NONE



15 **SITE LIGHTING POLE BASE ELECTRIC DETAIL**
SCALE: NONE



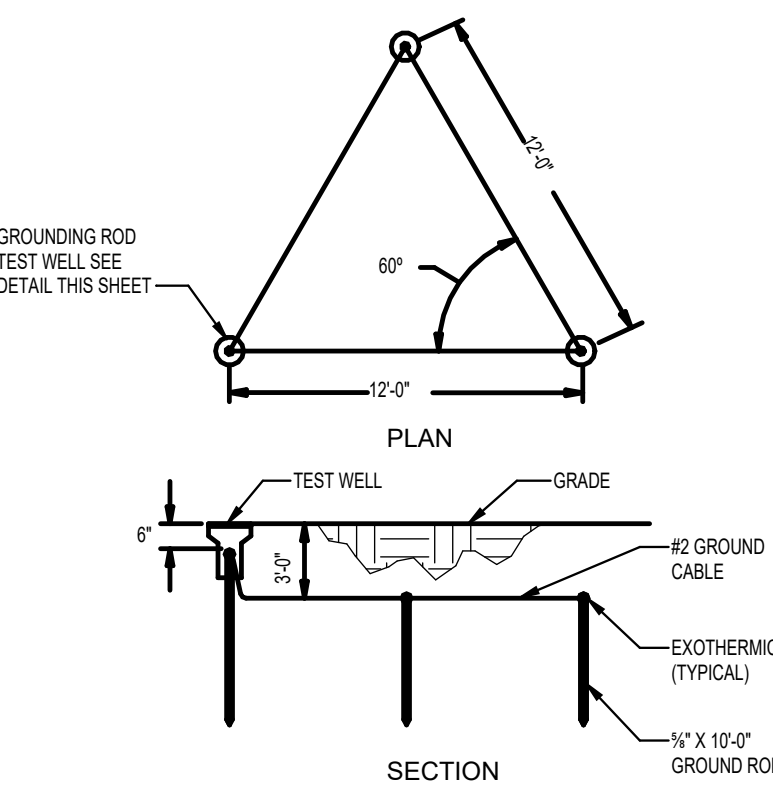
6 **ELECTRICAL HANDHOLE DETAIL**
SCALE: NONE



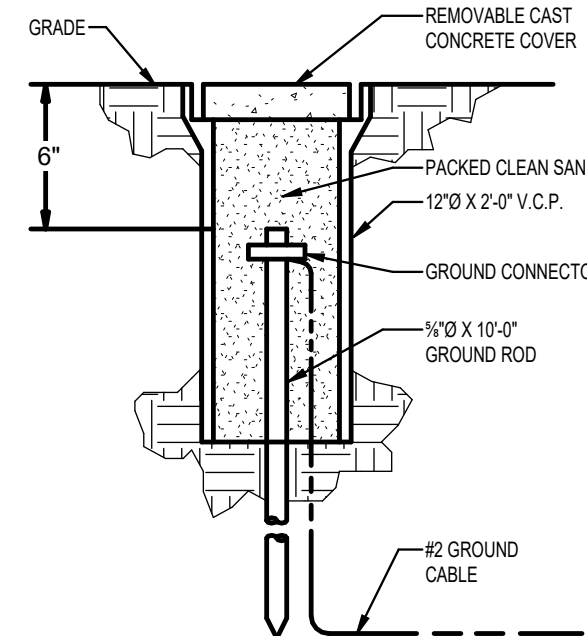
7 **HANDHOLE DETAIL INSTALLATION IN TURF AREAS**
SCALE: NONE

NOTE:
ELECTRICAL DRAWINGS

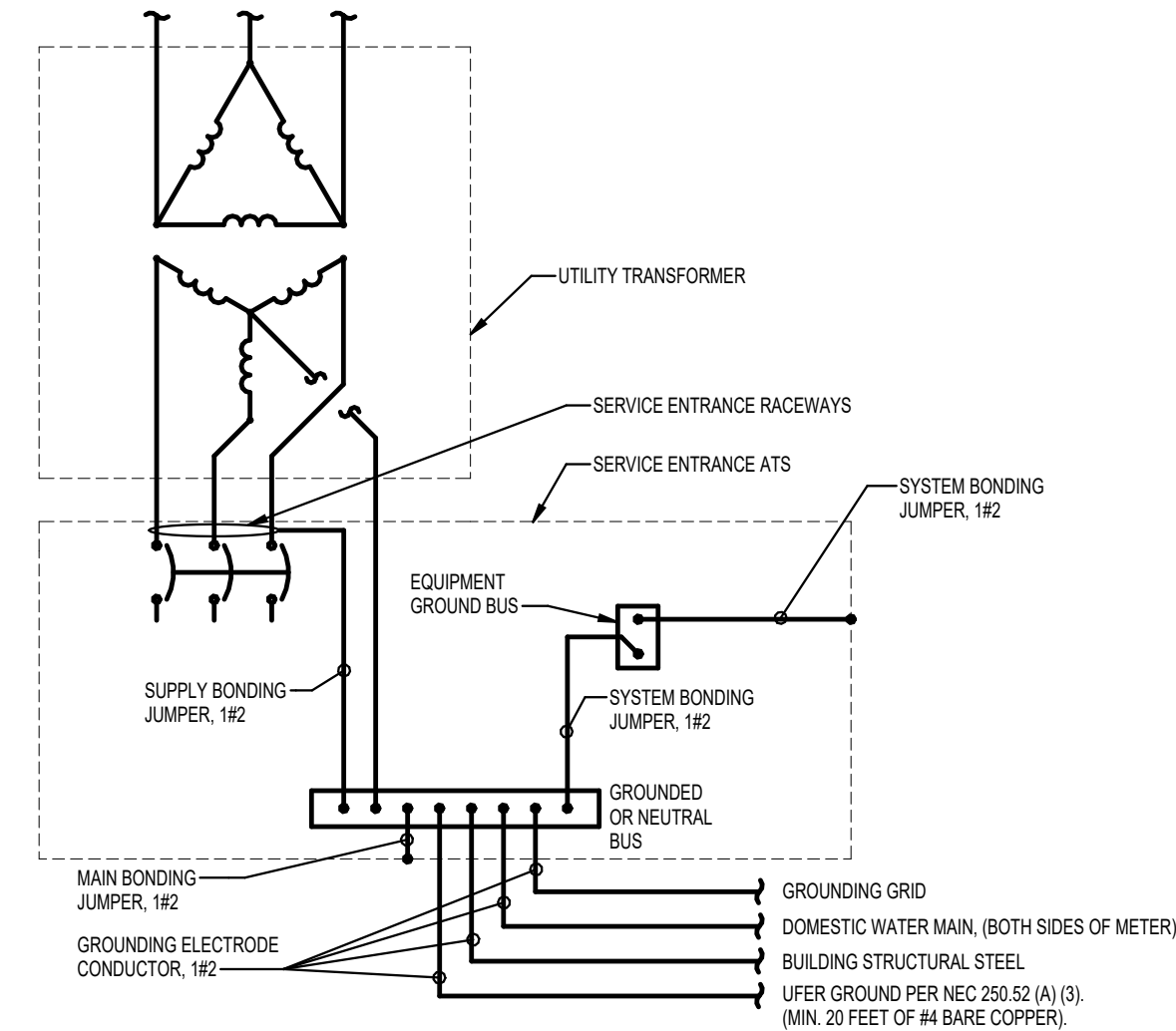
This work will be performed by the owner.
Successful contractor will need to coordinate their work with the owner's workforce.
This information is supplied for information only.



12 **GROUNDING GRID DETAIL**
SCALE: NONE



13 **GROUNDING ROD TEST WELL**
SCALE: NONE



14 **MAIN ELECTRICAL SERVICE GROUND SYSTEM DETAIL**
SCALE: NONE

RELEASE / REVISION		
No.	Date	Description



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Lawrence J. Merighi AIA
Ronald P. Portadin AIA
Peter W. Farrell AIA

AI-07220
AI-07473
AI-13038
AI-13618

Project

NEW POLE BARN FOR CITY
OF VINELAND PUBLIC
WORKS

Drawing

ELECTRICAL DETAILS

Scale As indicated	Job 23.089	Sheet E4.0
Drawn ZS	Date 10/08/2024	

**PLEASE USE THE
FOLLOWING DOCUMENTS
WHEN SUBMITTING BOTH
YOUR ORIGINAL AND
DUPLICATE BID**

PLEASE PRINT (LEGIBLY) OR TYPE

Accompanying this proposal is a certified check in the amount of \$_____, a cashier's check in the amount of \$_____, or a bid bond in the amount of \$_____, payable to the City of Vineland which is to be forfeited as liquidated damages, if in the event that this proposal is accepted, the undersigned shall fail to execute the contract or to furnish satisfactory bond as require.

WITNESS_____

The bidder shall state on the line below, if a corporation, the name of the state in which incorporated.

(Contact Person Who Prepared Proposal)

(Telephone Number)

(Federal I.D. Number)

(Email address)

COMPANY_____

ADDRESS_____

TELEPHONE_____

BY_____
(Signature)

(Name-please print or type)

(Title)

DATE_____

Have you attached the required items listed on the Check List? Failure to do so may result in automatic rejection of this bid.

(Fax Number)

BID CHECKLIST

**Failure by the bidder to submit with their bid all of the MANDATORY
Items that are check below shall be cause for rejection of bid.**

COV BID # _____

	<u>REQUIRED WITH BID</u>	<u>INITIAL & SUBMIT</u>
1. Bid Guarantee (IN DUPLICATE) (a bid bond is not a consent of surety)	_____	_____
2. Certificate or Consent of Surety Form (IN DUPLICATE)	_____	_____
3. Statement of Ownership Disclosure (IN DUPLICATE)	_____	_____
4. EEO/Affirmative Action Compliance Notice (IN DUPLICATE)	_____	_____
5. Check List (IN DUPLICATE)	_____	_____
6. Proposal (IN DUPLICATE)	_____	_____
7. Acknowledgement of Receipt of Addenda (IN DUPLICATE)	_____	_____
8. List of Subcontractors per NJSA 40A:11-16, if any, If none, state so. (IN DUPLICATE)	_____	_____

The items that are checked below shall be submitted no later than the time period indicated.

<u>Required as Conditioned</u>	<u>Item</u>	<u>Read, Initialed Shall Submit</u>
☐	Performance Bond (Due with the executed contract)	_____
☐	Labor and Material Payment Bond (Due with the executed contract)	_____
☐	Maintenance Bond (Due with the executed contract)	_____

(continued on next page)

☐	Public Works Contractor Registration Certificate(s) for the General or Prime Contractor and any Subcontractor submitted in the bid proposal with a date effective at the time the proposal is submitted (Due prior to contract award)	_____
☐	New Jersey Business Registration Certificate (Due prior to contract award)	_____
☐	Disclosure of Investment Activities in Iran (Due prior to contract award)	_____
☐	Certificate(s) of Insurance as specified In the Bid Document (Due with executed contract)	_____
☐	Certification of Non-Debarment for Federal Contracts. (Due prior to contract award)	_____
☐	Certification of Regarding Debarment Suspension. (Due prior to contract award)	_____

The items that are checked below are to be reviewed by the bidders.

<u>Review Required</u>	<u>Item</u>	<u>Read & Initialed</u>
☐	Americans with Disabilities Act Language	_____
☐	General Instructions	_____
☐	Technical Specifications	_____

THE ITEMS AND/OR FORMS INDICATED ABOVE SHALL BE REVIEWED AND/OR SUBMITTED WITH YOUR BID. THIS CHECKLIST IS PROVIDED FOR INFORMATIONAL PURPOSES ONLY. ALL REQUIRED DOCUMENTATION MAY NOT BE LISTED ABOVE AND IT SHALL BE THE RESPONSIBILITY OF THE BIDDER TO CAREFULLY REVIEW THE COMPLETE BID PACKAGE, FAMILIARIZE THEMSELVES WITH THE REQUIREMENTS OF THIS BID AND TO SUBMIT WITH THEIR BID ALL REQUIRED DOCUMENTATION.

SIGNATURE

The undersigned hereby acknowledges that they have submitted and/or reviewed the above listed requirements:

(COMPANY) (NAME – PLEASE PRINT OR TYPE)

(SIGNATURE) (DATE)

BID PROPOSAL

PROJECT IDENTIFICATION:

PUBLIC WORKS FACILITY BUILDINGS
78 PARK AVENUE VINELAND, NEW
JERSEY 08360

THIS BID IS SUBMITTED TO:

DIVISION OF PURCHASING
CITY OF VINELAND
640 EAST WOOD STREET
P.O. BOX 1508
VINELAND, NEW JERSEY 08362-1508

BID SUBMITTED BY:

(NAME) _____

-
1. The undersigned Bidder proposes and agrees, if the Bid is accepted, to enter into an Agreement with OWNER, in the form included in the Contract Documents to perform and furnish all Work as specified or indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.
 2. Bidder accepts all of the terms and conditions of the Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance as stated in Section 5.3 of the Instructions to Bidders. Bidder will sign and submit the Agreement with the Bonds and other documents required by the Bidding Requirements within fifteen days after the date of Owner's Notice of Award.
 3. In submitting this Bid, Bidder represents, as more fully set forth in the Agreement:

- (a) Bidder has examined copies of all the Bidding Documents and of the following Addenda (receipt of all which is hereby acknowledged):

Date	Number	Date	Number
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

- (b) Bidder has familiarized itself with the nature and extent of the Contract Documents, Work, site, locality, and all local conditions and Laws and Regulations that in any manner may affect cost, progress, performance or furnishing of the Work.
 - (c) Bidder has studied carefully all reports and drawings of subsurface conditions and drawings of physical conditions which are identified in the Supplementary Conditions as provided in Paragraph 3.2 of the General Conditions, and accepts the determination set forth in Paragraph GC-3.2.2 of the General Conditions, as may be amended by the Supplemental Conditions, of the extent the technical data contained in such reports and drawings upon which Bidder is entitled to rely.

- (d) Bidder has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests, and studies (in addition to or to supplement those referred to in (c) above) which pertain to the subsurface or physical conditions at the site or otherwise which may affect the cost, progress, performance or furnishing of the Work as Bidder considers necessary for the performance or furnishing of the Work at the Contract Price, within the Contract Times and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of Paragraph 4.2 of the General Conditions; and no additional examinations, investigations, explorations, tests, reports or similar information or data are or will be required by Bidder for such purposes.
- (e) Bidder has reviewed and checked all information and data shown or indicated on the Contract Documents with respect to existing Underground Facilities at or contiguous to the site and assumes responsibility for the accurate location of said Underground Facilities. No additional examinations, investigations, explorations, tests, reports or similar information or data in respect of said Underground Facilities are or will be required by Bidder in order to perform and furnish the Work at the Contract Price, within the Contract Times and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of Paragraph 4.3 of the General Conditions.
- (f) Bidder has correlated the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Contract Documents.
- (g) Bidder has given ARCHITECT written notice of all conflicts, errors or discrepancies that it has discovered in the Contract Documents and the written resolution thereof by ARCHITECT is acceptable to Bidder.
- (h) This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm, or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization, or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any person, firm or corporation to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.

4. Bidder will complete the Work for the price(s) shown.

Where materials are furnished by the OWNER, the prices provided herein are for installation only. Otherwise the prices include furnishing and installation of materials.

DIVISION I – GENERAL CONSTRUCTION

Base Bid BUILDING A – The Contractors Grand Lump Sum to complete the items depicted on the Contract Documents;

_____ DOLLARS (\$_____).

Base Bid BUILDING B – The Contractors Grand Lump Sum to complete the items depicted on the Contract Documents;

_____ DOLLARS (\$_____).

Base Bid BUILDING A + B (Combined) – The Contractors Grand Lump Sum to complete the items depicted on the Contract Documents;

_____ DOLLARS (\$_____).

ALTERNATE No. 1. DEDUCT: Change Motorized to Manually Operated:

1. Submit reduction in cost to change Overhead Doors #32 - #36 of BUILDING B as shown on Door Schedule on Sheet A/1.1 to manually operated doors. All other door requirements not associated to the operators shall remain the same.

(ADD)_____ DOLLARS (\$_____)

ALTERNATE NO. 2. DEDUCT: Reduce Building Square Footage:

1. Submit reduction in cost to DELETE (3) bays of westerly side of BUILDING A as depicted on Sheet A/1.0 and A/2.0. Delete framing and materials, doors, concrete and all items related to this area but maintain the exterior gable end wall.

(ADD)_____ DOLLARS (\$_____)

The respondent by signing this bid form, acknowledges that he/she has carefully examined the bid specifications and documents: and further acknowledges he/she understands and is able to render the scope of activity and services outlined in the bid.

Name: _____

Address: _____ P.O. Box _____

City, State, Zip Code _____

Federal Tax ID Number: _____

Phone Number: _____ Extension: _____

Authorized Agent: _____ Title: _____

Agent's Signature: _____ Date: _____

To be completed, signed, and returned with bid.

STATEMENT OF OWNERSHIP DISCLOSURE

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

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

Name of Organization: _____

Organization Address: _____

Part I

Check the box that represents the type of business organization:

- ☐ Sole Proprietorship (skip Parts II and III, execute certification in Part IV)
- ☐ Non-Profit Corporation (skip Parts II and III, execute certification in Part IV)
- ☐ For-Profit Corporation (any type)
- ☐ Limited Liability Company (LLC)
- ☐ Partnership
- ☐ Limited Partnership
- ☐ Limited Liability Partnership (LLP)
- ☐ Other (be specific): _____

Part II

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

OR

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

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

Name of Individual or Business Entity	Address

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

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

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

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

Stockholder/Partner/Member and Corresponding Entity Listed in Part II	Address

Part IV**Certification**

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

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

AFFIRMATIVE ACTION COMPLIANCE NOTICE
N.J.S.A. 10:5-31 and N.J.A.C. 17:27

GOODS AND SERVICES CONTRACTS
(INCLUDING PROFESSIONAL SERVICES)

This form is a summary of the successful bidder's requirement to comply with the requirements of N.J.S.A. 10:5-31 and N.J.A.C. 17:27-1 et seq.

The successful bidder shall submit to the public agency, after notification of award but prior to execution of this contract, one of the following three documents as forms of evidence:

(a) A photocopy of a valid letter that the contractor is operating under an existing Federally approved or sanctioned affirmative action program (good for one year from the date of the letter);

OR

(b) A photocopy of a Certificate of Employee Information Report approval, issued in accordance with N.J.A.C. 17:27-4;

OR

(c) A photocopy of an Employee Information Report (Form AA302) provided by the Division and distributed to the public agency to be completed by the contractor in accordance with N.J.A.C. 17:27-4.

The successful vendor may obtain the Affirmative Action Employee Information Report (AA302) from the contracting unit during normal business hours.

The successful vendor(s) must submit the copies of the AA302 Report to the Division of Contract Compliance and Equal Employment Opportunity in Public Contracts (Division). The Public Agency copy is submitted to the public agency, and the vendor copy is retained by the vendor.

The undersigned vendor certifies that he/she is aware of the commitment to comply with the requirements of N.J.S.A. 10:5-31 and N.J.A.C. 17:27.1 et seq. and agrees to furnish the required forms of evidence.

The undersigned vendor further understands that his/her bid shall be rejected as non-responsive if said contractor fails to comply with the requirements of N.J.S.A. 10:5-31 and N.J.A.C. 17:27-1 et seq.

COMPANY: _____ SIGNATURE: _____

PRINT NAME: _____ TITLE: _____

DATE: _____

**FAILURE BY BIDDER TO COMPLETE AND RETURN THIS NOTICE WITH THEIR BID SUBMISSION
SHALL BE CAUSE FOR THEIR BID TO BE REJECTED AS NON-RESPONSIVE**

CITY OF VINELAND
ACKNOWLEDGMENT OF RECEIPT OF ADDENDA

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

The undersigned Bidder hereby acknowledges receipt of the following Addenda:

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

☐ **No addenda were received:**

Acknowledged for: _____
(Name of Bidder)

By: _____
(Signature of Authorized Representative)

Name: _____
(Print or Type)

Title: _____

Date: _____



DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN FORM

STATE OF NEW JERSEY
DEPARTMENT OF THE TREASURY - DIVISION OF PURCHASE AND PROPERTY
33 WEST STATE STREET, P.O. BOX 230 TRENTON, NEW JERSEY 08625-0230

BID SOLICITATION # AND TITLE: _____

VENDOR NAME: _____

Pursuant to N.J.S.A. 52:32-57, et seq. (P.L. 2012, c.25 and P.L. 2021, c.4) any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract must certify that neither the person nor entity, nor any of its parents, subsidiaries, or affiliates, is identified on the New Jersey Department of the Treasury's Chapter 25 List as a person or entity engaged in investment activities in Iran. The Chapter 25 list is found on the Division's website at <https://www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf>. Vendors/Bidders must review this list prior to completing the below certification. If the Director of the Division of Purchase and Property finds a person or entity to be in violation of the law, s/he shall take action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the party.

CHECK THE APPROPRIATE BOX

☐ I certify, pursuant to N.J.S.A. 52:32-57, et seq. (P.L. 2012, c.25 and P.L. 2021, c.4), that neither the Vendor/Bidder listed above nor any of its parents, subsidiaries, or affiliates is listed on the New Jersey Department of the Treasury's Chapter 25 List of entities determined to be engaged in prohibited activities in Iran.

OR

☐ I am unable to certify as above because the Vendor/Bidder and/or one or more of its parents, subsidiaries, or affiliates is listed on the New Jersey Department of the Treasury's Chapter 25 List. I will provide a detailed, accurate and precise description of the activities of the Vendor/Bidder, or one of its parents, subsidiaries or affiliates, has engaged in regarding investment activities in Iran by completing the information requested below.

Entity Engaged in Investment Activities
Relationship to Vendor/ Bidder
Description of Activities

Duration of Engagement
Anticipated Cessation Date

**Attach Additional Sheets If Necessary.*

CERTIFICATION

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

Signature

Date

Print Name and Title



CERTIFICATION OF NON-INVOLVEMENT IN PROHIBITED ACTIVITIES IN RUSSIA OR BELARUS

Pursuant to N.J.S.A. 52:32-60.1, et seq. ([L. 2022, c. 3](#)) any person or entity (hereinafter "Vendor") that seeks to enter into or renew a contract with a State agency for the provision of goods or services, or the purchase of bonds or other obligations, must complete the certification below indicating whether or not the Vendor is identified on the Office of Foreign Assets Control (OFAC) Specially Designated Nationals and Blocked Persons list, available here: <https://sanctionssearch.ofac.treas.gov/>. If the Department of the Treasury finds that a Vendor has made a certification in violation of the law, it shall take any action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the party.

I, the undersigned, certify that I have read the definition of "Vendor" below, and have reviewed the Office of Foreign Assets Control (OFAC) Specially Designated Nationals and Blocked Persons list, and having done so certify:

(Check the Appropriate Box)

- ☐ A. That the Vendor is not identified on the [OFAC Specially Designated Nationals and Blocked Persons list on account of activity related to Russia and/or Belarus](#).
- OR**
- ☐ B. That I am unable to certify as to "A" above, because the Vendor is identified on the [OFAC Specially Designated Nationals and Blocked Persons list on account of activity related to Russia and/or Belarus](#).
- OR**
- ☐ C. That I am unable to certify as to "A" above, because the Vendor is identified on the [OFAC Specially Designated Nationals and Blocked Persons list](#). However, the Vendor is engaged in activity related to Russia and/or Belarus consistent with federal law, regulation, license or exemption. A detailed description of how the Vendor's activity related to Russia and/or Belarus is consistent with federal law is set forth below.

(Attach Additional Sheets If Necessary.)

Signature of Vendor's Authorized Representative

Date

Print Name and Title of Vendor's Authorized Representative

Vendor's FEIN

Vendor's Name

Vendor's Phone Number

Vendor's Address (Street Address)

Vendor's Fax Number

Vendor's Address (City/State/Zip Code)

Vendor's Email Address

ⁱ Vendor means: (1) A natural person, corporation, company, limited partnership, limited liability partnership, limited liability company, business association, sole proprietorship, joint venture, partnership, society, trust, or any other nongovernmental entity, organization, or group; (2) Any governmental entity or instrumentality of a government, including a multilateral development institution, as defined in Section 1701(c)(3) of the International Financial Institutions Act, 22 U.S.C. 262r(c)(3); or (3) Any parent, successor, subunit, direct or indirect subsidiary, or any entity under common ownership or control with, any entity described in paragraph (1) or (2).

**CERTIFICATION REGARDING THE DEBARMENT
SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION**

I am _____ of the firm of _____,
(Your title) (Name of your Organization)

(Address of your Organization)

CHOOSE ONE OF THE FOLLOWING

☐

A. I hereby certify on behalf of _____
(Name of your Organization)

That neither it nor its principals are included on the State Treasurer's and Economic Development Authority's or the Federal Government's list of Debarred, Suspended or Disqualified bidders as a result of action taken by any State or Federal Agency.

☐

B. I am unable to certify to any of the statements set forth in the certification. I have attached an explanation to this form.

Subscribed and sworn to
Before me this day of

(Date)

(Signature)

(Signature of Notary Public)

(Typed or Printed Name & Title)

My Commission expires _____
(Date)

**CERTIFICATION OF NON-DEBARMENT
FOR FEDERAL GOVERNMENT CONTRACTS**

N.J.S.A. 52:32-44.1 (P.L. 2019, c.406)

This certification shall be completed, certified to, and submitted to the contracting unit prior to contract award, except for emergency contracts where submission is required prior to payment.

PART I: VENDOR INFORMATION	
Individual or Organization Name	
Physical Address of Individual or Organization	
Unique Entity ID (if applicable)	
CAGE/NCAGE Code (if applicable)	
Check the box that represents the type of business organization:	

- ☐ Sole Proprietorship (skip Parts III and IV) ☐ Non-Profit Corporation (skip Parts III and IV)
- ☐ For-Profit Corporation (any type) ☐ Limited Liability Company (LLC) ☐ Partnership
- ☐ Limited Partnership ☐ Limited Liability Partnership (LLP)
- ☐ Other (be specific): _____

PART II – CERTIFICATION OF NON-DEBARMENT: Individual or Organization			
I hereby certify that the individual or organization listed above in Part I is not debarred by the federal government from contracting with a federal agency. I further acknowledge: that I am authorized to execute this certification on behalf of the above-named organization; that the City of Vineland is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the date of contract award by City of Vineland of Vineland to notify the City of Vineland in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the City of Vineland, permitting the City of Vineland to declare any contract(s) resulting from this certification void and unenforceable.			
Full Name (Print):		Title:	
Signature:		Date:	

PART III – CERTIFICATION OF NON-DEBARMENT: Individual or Entity Owning Greater than 50 Percent of Organization

Section A (Check the Box that applies)

☐	Below is the name and address of the stockholder in the corporation who owns more than 50 percent of its voting stock, or of the partner in the partnership who owns more than 50 percent interest therein, or of the member of the limited liability company owning more than 50 percent interest therein, as the case may be.
Name of Individual or Organization	
Physical Address	

OR

☐	No one stockholder in the corporation owns more than 50 percent of its voting stock, or no partner in the partnership owns more than 50 percent interest therein, or no member in the limited liability company owns more than 50 percent interest therein, as the case may be.
--------------------------	--

Section B (Skip if no Business entity is listed in Section A above)

☐	Below is the name and address of the stockholder in the corporation who owns more than 50 percent of the voting stock of the organization's parent entity, or of the partner in the partnership who owns more than 50 percent interest in the organization's parent entity, or of the member of the limited liability company owning more than 50 percent interest in organization's parent entity, as the case may be.
Stockholder/Partner/Member Owning Greater Than 50 Percent of Parent Entity	
Physical Address	

OR

☐	No one stockholder in the parent entity corporation owns more than 50 percent of its voting stock, no partner in the parent entity partnership owns more than 50 percent interest therein, or no member in the parent entity limited liability company owns more than 50 percent interest therein, as the case may be.
--------------------------	---

Section C – Part III Certification

I hereby certify that no individual or organization that is debarred by the federal government from contracting with a federal agency owns greater than 50 percent of the **Organization listed above in Part I** or, if applicable, owns greater than 50 percent of a parent entity of _____. I further acknowledge: that I am authorized to execute this certification on behalf of the above-named organization; that the **City of Vineland** is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the date of contract award **City of Vineland** to notify the **City of Vineland** in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the **City of Vineland**, permitting the **City of Vineland** to declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print):

Title:

Signature:

Date:

Part IV – CERTIFICATION OF NON-DEBARMENT: Contractor – Controlled Entities**Section A**

Below is the name and address of the corporation(s) in which the **Organization listed in Part I** owns more than 50 percent of voting stock, or of the partnership(s) in which the **Organization listed in Part I** owns more than 50 percent interest therein, or of the limited liability company or companies in which the **Organization listed above in Part I** owns more than 50 percent interest therein, as the case may be.

Name of Business Entity**Physical Address******Add additional sheets if necessary******OR**

The **Organization listed above in Part I** does not own greater than 50 percent of the voting stock in any corporation and does not own greater than 50 percent interest in any partnership or any limited liability company.

Section B (skip if no business entities are listed in Section A of Part IV)			
☐		Below are the names and addresses of any entities in which an entity listed in Part III A owns greater than 50 percent of the voting stock (corporation) or owns greater than 50 percent interest (partnership or limited liability company).	
Name of Business Entity Controlled by Entity Listed in Section A of Part IV		Physical Address	
Add additional Sheets if necessary			
OR			
☐		No entity listed in Part III A owns greater than 50 percent of the voting stock in any corporation or owns greater than 50 percent interest in any partnership or limited liability company.	
Section C – Part IV Certification			
I hereby certify that the Organization listed above in Part I does not own greater than 50 percent of any entity that that is debarred by the federal government from contracting with a federal agency and, if applicable, does not own greater than 50 percent of any entity that in turns owns greater than 50 percent of any entity debarred by the federal government from contracting with a federal agency. I further acknowledge: that I am authorized to execute this certification on behalf of the above-named organization; that the City of Vineland is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the date of contract award by City of Vineland to notify the City of Vineland in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the City of Vineland, permitting the City of Vineland to declare any contract(s) resulting from this certification void and unenforceable.			
Full Name (Print):		Title:	
Signature:		Date:	

SAMPLE FORM OF BID BOND

A. We, the undersigned

_____ as Principal and
_____ as Surety, are hereby held and firmly bound unto
_____ in the penal sum of _____ Dollars

(\$_____, lawful money of the United States for the payment of which well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns. Signed this

_____ day of _____ 20_____

B. THE CONDITION of the above obligation is such that whereas the Principal has submitted to the _____,

a certain bid attached hereto and hereby made a part of hereto and hereby made a part of hereof, to enter into a contract in writing for the (insert type of work)

C. NOW THEREFORE:

If said bid shall be rejected, or in the alternate, if said bid shall be accepted and the Principal shall execute and deliver a contract in the form of Agreement required by the Bid Documents and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all respects perform the agreement created by the acceptance of said bid. Then this obligation shall be void, otherwise the same shall remain in force and effect, it being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

D. THE SURETY for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall in no way be impaired or affected by an extensions of the time within the "OBLIGEE" may accept such bid. And said Surety does hereby waive notice of any such extension.

E. IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as corporations have caused their corporate seals to be hereto fixed and these presents to be signed by their proper officers, the day and year set forth above.

PRINCIPAL (L.S.)

SURETY

(SEAL)

BY

NOTE: Bid Bond must be signed by an authorized agent or representative of a surety company and not by the individual or company submitting the bid.

SURETY FORM

The City of Vineland has provided this certificate of surety for submission to a bidder's insurance/bonding company. Language such as this will be accepted; however, language that limits the timeframe in which the City can process claims against a performance bond or language that states the surety is conditional depending on contract terms, will not be accepted. (Contract terms will be as outlined in the bid specifications).

To: Purchasing Board
City of Vineland
640 E. Wood Street
Vineland, NJ 08360

NAME OF INSURANCE/BONDING COMPANY

Being duly qualified to transact business in the State of New Jersey, hereby certifies and agrees that if:

CONTRACTOR NAME

Is the successful bidder for _____

_____ It as surety, will provide the bidder with the
bonds as are called for in the bid specifications.

Signed and Sealed _____

NAME OF INSURANCE/BONDING COMPANY

Printed Name of Attorney-in-Fact

Signature of Attorney-in-Fact

Power of Attorney for the Attorney-in-Fact must be attached to Consent of Surety and corporate seal of the surety company must be affixed to the Surety form.

Certificate of Surety must be signed by an authorized agent or representative of a surety company and not by the individual or company submitting the bid.

Insurance/Bonding Company to provide the following:

Name: _____ Title: _____

Address: _____

Telephone Number: _____

CITY OF VINELAND
LIST OF SUBCONTRACTORS
(as required by NJSA40A:11-16)

COV BID # _____

The following subcontractors are to be used on this project in the four (4) specialty trade categories noted below: These subcontractors must be registered with the Department of Labor's Division of Wage and Hour Compliance (Public Works Contractor Registration) at the time proposals are received.

NOTE: If the project's scope of work does not involve any of the specialty trade categories below, please write the word "**NONE**" in each appropriate space(s).

If the project's scope of work does involve any of the specialty trade categories below, but will be done "in-house" by the General Contractor or a qualified, licensed employee(s), where required, or by such other employee(s) on the contractor's payroll, write the word "**IN-HOUSE**" and provide the names(s) and license number(s), where required, or the name(s) of those employees(s) in each of the appropriate spaces below:

DO NOT LEAVE ANY SPACE BLANK

1. PLUMBING AND GAS FITTING AND ALL KINDRED WORK:

Name: _____

Address: _____

License Number: _____

2. STEAM AND HOT WATER HEATING AND VENTILATING APPARATUS AND ALL KINDRED WORK:

Name: _____

Address: _____

3. ELECTRICAL WORK:

Name: _____

Address: _____

4. STRUCTURAL STEEL AND ORNAMENTAL IRON WORK:

Name: _____

Address: _____

BY: _____

(SIGNATURE OF AUTHORIZED REPRESENTATIVE)

NAME: _____

(PLEASE PRINT)

DATE: _____

THE ABOVE NAMED SUBCONTRACTORS MUST BE REGISTERED WITH THE DEPARTMENT OF LABOR'S DIVISION OF WAGE AND HOUR COMPLIANCE (PUBLIC WORKS CONTRACTORS REGISTRATION) AT THE TIME PROPOSALS ARE RECEIVED.

BUSINESS REGISTRATION CERTIFICATES MUST BE SUBMITTED, FOR ANY OF THE COMPANIES/INDIVIDUALS LISTED ABOVE AS ONE OF THE FOUR PRIME SUB-CONTRACTORS.