PROJECT MANUAL

NEW PUBLIC SAFETY BUILDING
AT THE
MAYS LANDING CAMPUS

FOR THE

ATLANTIC CAPE COMMUNITY COLLEGE
5100 BLACK HORSE PIKE
MAYS LANDING, NEW JERSEY 08330

ACCC Bid No. 1860
Commission Number: 20U008

Date: June 12, 2020

SPIEZLE ARCHITECTURAL GROUP, INC.

PROJECT MANUAL

NEW PUBLIC SAFETY BUILDING
AT THE
MAYS LANDING CAMPUS

FOR THE

ATLANTIC CAPE COMMUNITY COLLEGE
5100 BLACK HORSE PIKE
MAYS LANDING, NEW JERSEY 08330

ARCHITECT:

SPIEZLE ARCHITECTURAL GROUP, INC. 1395 YARDVILLE-HAMILTON SQUARE ROAD SUITE 2A HAMILTON, NEW JERSEY 08691 TELEPHONE NUMBER: (609) 695-7400 FAX NUMBER: (609) 394-2274 NEW JERSEY LICENSED ARCHITECT 21AC00063000 21AI01294900 21AI01505400 21AI01439400 21AI01674400	SEAL & SIGNATURE

COMMISSION NO. 20U008

MECHANICAL ELECTRICAL AND PLUMBING ENGINEER:

JOHNSON & URBAN, LLC 295 HIGHWAY 34 COLTS NECK, NEW JERSEY 07722 TELEPHONE NUMBER: (732) 772-1500 FAX NUMBER: (732) 772-1515 NEW JERSEY PROFESSIONAL ENGINEER NJ PE# 24GE04074900	_____ SEAL & SIGNATURE

COMMISSION NO. 20U008

STRUCTURAL ENGINEER:

HARRISON-HAMNETT, P.C. 40 KNOWLES STREET PENNINGTON, NEW JERSEY 08534 TELEPHONE NUMBER: (609) 818-1808 FAX NUMBER: (609) 818-1809 NEW JERSEY PROFESSIONAL ENGINEER PE# 17976	_____ SEAL & SIGNATURE

SECTION 000115 - CONTRACT DRAWINGS

Drawings listed below provide for complete construction of this Project and are part of the Contract Documents.

DWG. NO.	TITLE
CS.1	COVER SHEET
CP.1	CODE PLANS AND GENERAL INFORMATION
A1.0	SITE DEMOLITION PLAN & PROPOSED PLAN
A1.1	PLANS, ENLARGED PLAN, INTERIOR ELEVATIONS
A1.2	INTERIOR ELEVATIONS
A2.1	EXTERIOR ELEVATION, SECTIONS AND DETAILS
A3.1	WALL SECTIONS AND DETAILS
S1.1	STRUCTURAL FOUNDATION PLAN AND FRAMING PLAN
M0.1	MECHANICAL SYMBOLS & ABBREVIATIONS
M0.2	MECHANICAL GENERAL NOTES
M1.1	MECHANICAL PLANS
P1.1	PLUMBING GENERAK INFO. & FLOOR PLANS
P1.2	PLUMBING DETAILS
E0.1	ELECTRICAL SYMBOLS & ABBREVIATIONS
E0.2	ELECTRICAL NOTES & SPECIFICATIONS
E1.0	ELECTRICAL SITE PLANS
E1.1	ELECTRICAL FLOOR & ROOF PLANS

The Architect may furnish additional drawings as may be required for further explanation of details for work under this Contract, but these drawings will not include shop drawings. Shop Drawings shall be completed and submitted for Architect’s review for compliance with the contract documents prior to the starting of work by the Contractor, as specified herein.

END OF SECTION 000115

PUBLIC NOTICE

ATLANTIC CAPE COMMUNITY COLLEGE

In accordance with Drawings and Project Manual, Commission No. **20U008**, dated **August 28, 2020** together with all work incidental thereto as prepared by the Spiezle Architectural Group, Inc., 1395 Yardville-Hamilton Square Road, Hamilton, New Jersey, 08691.

All bids should be addressed to the attention of **Purchasing Department.** Bids must be made on the proposal forms in the manner designated, enclosed in a sealed envelope bearing the name and address of the bidder and the proposal identification on the outside of the envelope. Sealed bids will be received by the Board of Trustees of the Atlantic Cape Community College at **Building J, Room J230**, the **Purchasing Office** at the Mays Landing Campus, 5100 Black Horse Pike, Mays Landing, New Jersey 08330. The deadline to submit sealed bids is **September 24, 2020** at **10:00 AM** prevailing time. Immediately thereafter, in **Building J, Conference Room J-207**, Atlantic Cape Community College Mays Landing Campus, bids will publicly opened and read aloud immediately thereafter for:

A SINGLE OVERALL CONTRACT FOR:

NEW PUBLIC SAFETY BUILDING
MAYS LANDING CAMPUS
ACCC Bid No. 1860

FOR THE

ATLANTIC CAPE COMMUNITY COLLEGE

MAYS LANDING CAMPUS
5100 BLACK HORSE PIKE
MAYS LANDING, NEW JERSEY 08330

Package must be accompanied with a Certified Check, Cashier's Check or a Bid Bond drawn to the order of Atlantic Cape Community College for not less than ten percent (10%), and must be delivered to the attention of the Chief Business Officer, or the designated representative at the above place on or before the time of bid opening.

Neither the Atlantic Cape Community College, nor the Architect will assume any responsibility for Bids mailed or misdirected in delivery. No bid may be withdrawn for a period of sixty (60) days after the date set for the opening thereof. The right is reserved to reject any or all bids or to waive any informality in the bidding if it is in the interest of the Owner to do so.

Bidding and Contract Requirements, Bid Forms, Specifications and Contract Drawings and other Contract Documents may be examined during normal office hours at Architect's Office, 1395 Yardville Hamilton Square Road, Suite 2A, Hamilton, New Jersey 08691.

Project Bidding Schedule:

Project Advertised for Bid	**August 31, 2020**
Non-mandatory Pre-Bid Meeting	**September 2, 2020 Room J-202 at 2:00 PM**
Last Day for RFI	**September 10, 2020 by 2:00 PM**
Issuance of Addendum (if required)	**September 15, 2020 by 5:00 PM**
Bid Submission	**September 24, 2020 by 10:00 AM**

Drawings and Project Manuals will be available at the Architect's Office for Bidders upon a non-refundable deposit of Fifty ($50.00) Dollars and can be obtained at the office of the Architect. Documents will be made available in PDF format and made available by disc. A separate non-refundable cost of Twenty-Five ($25.00) Dollars per set will be charged for mailing and handling Contract Documents to Contractors if requested. A separate non-refundable handling charge of Fifteen ($15.00) Dollars per set will be charged for sending Contract Documents via Federal Express as prearranged and paid for by the Bidder. A check for Bidding Documents (and separate non-refundable checks for mailing and/or handling, when requested) shall be made payable to the "Spiezle Architectural Group, Inc." Any Bidders should contact the Architect's Office at (609) 695-7400 to confirm details of availability of Contract Drawings, Specifications and other Contract Documents. Additional sets may be purchased at the same rates.

The bids will be publicly opened and read aloud at the time and place set forth above. No bids will be received after that time unless the contract is re-advertised for bids. Bidders are responsible for seeing that their bids arrive at the Purchasing Office at the address specified above before the opening date and time. Bids delivered in person or by express service should be delivered directly to the Purchasing Office.

If the bid exceeds $20,000, bidder must be prequalified by the New Jersey Department of the Treasury, Division Building and Construction, prior to the date that bids are received. Any bid submitted under the terms of New Jersey Statues not including a copy of a valid and active Prequalification / Classification Certificate will be rejected as be non-responsive to bid requirements. Bidder must comply with P.L. 1999, C-238, the Public Works Contract Registration Act.

Bidders are subject to the provisions of the County College Contracts Laws N.J.S.A. 18A:64A-25.25 governing bidding requirements. Bidders for contracts exceeding the bid threshold must be pre-qualified by the state of New Jersey, Department of the Treasury, Division of Property Management and Construction. Bidding Contractors must be pre-qualified as either "C008 General Construction" or "C009 General Construction / Alterations and Additions". Each bid must be accompanied by an affidavit so certifying if applicable.

The Contractor is required to conform to the requirements of the New Jersey Prevailing Wage Act P.L. 1963.c150. Copies of the Rate Determination are available for review online, on the State of New Jersey's website.

Bidders are requested to submit questions directly to John F. Wright and Shawn Fedetz at Spiezle Architectural Group, Inc. (jwright@spiezle.com; sfedetz@spiezle.com) with an email copy to Mr. Ed Perkins (eperkins@atlantic.edu) at the Atlantic Cape Community College, Mays Landing, New Jersey 08330, prior to the date indicated above.

A pre-bid meeting and project site walk through is scheduled to occur on the date and time indicated above. Bidders should meet at the **J Building, Room J-202** at the Mays Landing Campus. The pre-bid

meeting is not mandatory, but attendance is strongly encouraged. However, it is mandatory that the bidders must conduct a site visit, and the bidders must submit a Site Verification Form with their bids.

"Bidders are required to comply with the requirements of Affirmative Action P.L. 1975, c.127 (N.J.A.C. 17:27) and P.L. 1999, c.238 The Public Works Contractor Registration Act." and the requirements of P.L. 2004, c. 57 Contractors Business Registration Act."

By Order of:
Board of Trustees
Atlantic Cape Community College
Mays Landing, New Jersey 08330

PROJECT MANUAL

NEW PUBLIC SAFETY BUILDING
MAYS LANDING CAMPUS

FOR THE

ATLANTIC CAPE COMMUNITY COLLEGE
MAYS LANDING CAMPUS
5100 BLACK HORSE PIKE
MAYS LANDING, NEW JERSEY 08330

TABLE OF CONTENTS

TECHNICAL SPECIFICATIONS

DIVISION 31 SITE

END OF TABLE OF CONTENTS

SECTION 002113 - INFORMATION FOR BIDDERS

A. GENERAL TERMS

1. All papers bound or attached to these bid documents are a necessary part hereof. All bids are submitted subject to the requirements and conditions in the bidding documents.
2. Proposals for the Contracts as listed in the Public Notice as hereinafter described will be received for the performance of the Project. The bids shall cover all cost of any nature, incident to and growing out of the Work. In explanation but no in limitation thereof, these costs shall include the cost of all work, labor, materials, equipment, transportation and cost of all else necessary to perform and complete the Project in the manner and within the time required, all incidental expenses in connection therewith, all costs on account of loss by damage or destruction of the Project to the extent that the cost of such loss is not recovered from insurance carried by the Owner and the Contractor, and any additional expenses for unforeseen difficulties encountered, for settlement of damages and for replacement of defective work and materials.
3. Examination of Documents. Plans, specifications, and other bidding documents may be examined during normal business hours (8:00 AM to 5:00 PM) at the architect's office and plan rooms at the addresses specified in the Public Notice.
4. Authority of Atlantic Cape Community College. On all questions concerning the interpretation of specifications; the acceptability of quality of materials or items furnished and work performed; the execution of the work; and the determination of payment due or to become due, the decision of the Atlantic Cape Community College Board of Trustees shall be final and binding.
5. Submission of Bids. Bidders are to seal their bids in an envelope. The outside of this envelope must display the title of the bid and the name and address of the bidder. No bids will be received after the date and time specified herein unless the contract is re-advertised for bids. Bidders are responsible for ensuring that their bids arrive at the Purchasing Office before the opening date and time. Bids delivered in person or by express service should be delivered directly to the Purchasing Office at the Atlantic Cape Community College, 5100 Black Horse Pike, Mays Landing, New Jersey 08330. Bids sent via regular mail should be sent to Purchasing Office at the Atlantic Cape Community College, 5100 Black Horse Pike, Mays Landing, New Jersey 08330, Building J, Room 230. Bids mailed to the Post Office box must be received one day prior to bid receipt date to insure timely receipt at the Bid Opening location. Neither the Atlantic Cape Community College, nor the Architect will assume any responsibility for Bids mailed or misdirected in delivery.
6. Modifications of Bids. Any bidder may modify a bid at any time prior to the scheduled closing time for the receipt of bids. The modification must bear an original signature of the bidder. It must be in a sealed envelope; the outside of this envelope must display the title of the bid, the name and address of the bidder, and the word "MODIFICATION."
7. Withdrawal of Bids. Any bid may be withdrawn prior to the scheduled time for opening bids or the authorized postponement thereof. No bidder may withdraw a bid within 60 days after the actual date on which it is opened.
8. Qualifications of Bidder. The College may make such investigation as it deems necessary to determine the ability of the bidder to perform the terms of the contract, and the bidder shall furnish the College all the information for this purpose which the College may request. The College reserves the right to reject any bid if its investigation of the bidder reveals that, in the

opinion of the College, the bidder is not properly qualified to carry out the obligations of the contract and complete it as outlined herein.

9. Bidding Contractors must be pre-qualified as either "C008 General Construction" or "C009 General Construction / Alterations and Additions". Each bid must be accompanied by an affidavit so certifying if applicable.

10. Subcontracts. Each bidder is hereby advised that any person, firm or other party to whom it is proposed to award a sub-contract under the bidder's contract must be acceptable to the College. Evidence of sub-contractor performance security must be submitted with the bid. Subcontractor's performance security can be provided by the Contractor or Subcontractor. All other certifications required of the bidder must also be obtained from any sub-contractor and furnished to the College prior to commencement of work. If Contractor intends and is licensed to also executing plumbing and gas fitting work; heating and ventilating systems and equipment; electrical work; structural steel and ornamental iron work, as applicable to project's scope of work, this must be noted on subcontractor identification form (004336).

11. Under the County College Contracts Law, N.J.S.A. 18A:64A-25.25, all bids submitted shall set forth the name or names of, and evidence of performance security from, all subcontractors to whom the bidder will subcontract the work for general construction, plumbing and gas fitting work, heating and ventilating systems and equipment, or electrical work, or structural steel and ornamental iron work.

12. Interpretations, Clarifications and Addenda. Should any bidder find what appears to be an ambiguity, discrepancy or omission in any of the documents, the bidder shall at once notify the College which will determine whether written interpretations should be sent to all bidders. Every request for interpretation shall be addressed in writing to the College, and, to be given consideration, must be received at least nine business days prior to the date fixed for the opening of bids. All such interpretations and supplemental instructions will be issued in the form of written clarifications or addenda which will become part of the contract; and all such interpretations and supplemental instructions will be mailed to all prospective bidders at their respective addresses furnished for such purposes not later than seven business days prior to the date fixed for the opening of bids. The failure of any bidder to receive any such addendum or interpretation shall not relieve any such bidder from any obligation under this bid as submitted. No oral interpretations will be made to any Bidder as to the meaning of the drawings and specifications.

    Addenda shall take precedence over the original drawings and specifications insofar as the definition, interpretation and intent of the Work are concerned. With the list of addenda, the order of precedence will be in ascending order of addenda numbering.

13. In the event of inclement weather, the College maintains the right to reschedule the bid opening.

14. New Equipment. All equipment, supplies and materials for which bids are requested shall be new, unless otherwise specified.

15. Obligation of Bidders. All bidders will be presumed to be familiar with the plans and specifications, notice to bidders, and all documents included in the bid documents including all addenda; and to have inspected the site. In addition, all bidders must inform themselves fully of the conditions relating to performance of the contract, any construction involved and the employment of any labor thereon. Failure to do any of the foregoing will not relieve any bidder of any obligation with respect to the bid as submitted and/or contract.

16. Waiver of Informalities/Rejection of Bids. The College may consider informal any bid not prepared and submitted in accordance with the bid documents and may waive any informalities; or it may for any reason reject any and all bids.

B. APPLICABLE LAWS AND REGULATIONS

1. Bidders on service contracts, or on equipment which require installation by the contractor, are advised that the provisions of P.L. 1963, c. 150 (New Jersey Prevailing Wage Act) will apply to and be part of the contract. For job categories not covered under prevailing wage rates, bidders are required to pay to workers at least the legally established minimum wage at all times during the contract period.
2. Bidders are required to comply with the affirmative action requirements of P.L. 1975, c. 127 {NJAC 17:27}. For construction contracts, the successful vendor must submit State of New Jersey Form AA-201 (Initial Manning Report) and subsequent ongoing Manning Reports.
3. All equipment supplied to Atlantic Cape Community College and all installation work performed at Atlantic Cape Community College must comply with PEOSHA regulations and meet PEOSHA standards.
4. The successful bidder is required to keep informed of and to comply with all authorities having jurisdiction over the subject matter of the contract. The Owner shall be responsible for reimbursing the Contractor for all permits, governmental fees and licenses necessary for the lawful execution and completion of the work required by the contract. The Contractor will obtain construction permits from the Township of Hamilton, Atlantic County. The College is an exempt organization and no fee will be required for construction permits. The successful bidder is required to assist the Owner in obtaining permits.
5. Construction Contracts: Each bidder shall be pre-qualified in accordance with the standards of the New Jersey Department of the Treasury, Department of Building and Construction (N.J.A.C. 17:19-2.1 et. seq.), and shall submit with the bid a copy of the current Notice of Classification and Total Amount of Uncompleted Contracts.
6. State of New Jersey – Laws of 1977 Chapter 33: Conflict of Interest: No corporation or partnership shall be awarded any contract or shall any agreement be entered into for the performance of any work or the furnishing of any materials or supplies, the cost of which is to be paid with or out of any public funds, by the State, or any county, municipality or school district, or any subsidiary or agency of the State, or of any county, municipality or school district, or by any authority, board, or commission which exercises governmental functions, unless prior to the receipt of the bid or accompanying the bid of said corporation or said partnership, there is submitted a statement setting forth the names and address of all stockholders in the corporation or partnership who own 10% or more of its stock, or any class or of all individual partners in the partnership who own a 10% or greater interest therein, as the case may be. If one or more such stockholder or partner is itself a corporation or partnership, the stockholders holding 10% or more of that corporation's stock, or the individual partners owning 10% or greater interest in that partnership, as the case may be, shall also be listed. The disclosure shall be continued until names and addresses of every non-corporate stockholder and individual partner exceeding the 10% ownership criteria established in this act has been listed.

7. Americans with Disabilities Act (A.D.A.) Equal Opportunity for Individuals with Disability: The Contractor and the County College do hereby agree that the provisions of Title II of the Americans With Disabilities Act of 1990 (the "ACT") (42 U.S.C. S12101 et seq.) which prohibits discrimination on the basis of disability by public entities in all services, programs, and activities provided or made available by public entities, and the rules and regulations promulgated pursuant thereunto, are made a part of this contract. In providing any aid, benefit, or service on behalf of the County College pursuant to this contract, the Contractor agrees that the performance shall be in strict compliance with the Act.

8. Construction Contracts: Required Contractor Registration for Public Works Projects: “The Public Works Contractor Registration Act” (P.L. 1999, c.238), effective April 11, 2000, requires that all contractors and subcontractors must be registered with the New Jersey Department of Labor in order to bid on or engage in any contract for public work. Bidders must include evidence of registration, i.e. certificate from the Department of Labor indicating compliance, or copy of application for registration.

9. The College requires that the contractor demonstrate a safety and health program/plan referencing first aid, fire protection, housekeeping, illumination, sanitation, personal protective equipment, medical, exits and emergency action plans. This document will be site specific for inspection and training and will serve to communicate these work practices to all project contractors.

10. Business Registration Certificate, P.L. 2009, c.315: Effective September 1, 2004, N.J.S.A. 52:32-44 requires mandatory “Business Registration” for any vendor doing business in the State of New Jersey. A copy of the Business Registration Certificate issued by the New Jersey Department of Treasury / Division of Revenue shall be provided no less than 10 (ten) business days prior to Board Approval. Please contact New Jersey Department of Treasury / Division of Revenue with any questions or concerns at (609) 292-1730.

    Pursuant to N.J.S.A. 54:49-4.1, a business organization that fails to provide a copy of a business registration, 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 business registration copy not properly provided under a contract with a contracting agency.

11. Record Retention: N.J.A.C. 17:44-2.2 requires that the selected vendor shall maintain all documentation 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.

12. Political Contributions: Any business entity making a contribution of money or any other thing of value, including an in-kind contribution, or pledge to make a contribution of any kind to a candidate for or the holder of any public office having ultimate responsibility for the awarding of public contracts, or to a political party committee, which has received in any calendar year $50,000 or more in the aggregate through agreements or contracts with a public entity, shall file an annual disclosure statement with the New Jersey Election Law Enforcement Commission, established pursuant to section 5 of P.L 1973, c83 (C. 19:44A-5), setting forth all such contributions made by the business entity during the 12 months prior to the reporting deadline.

C. PREPARATION OF BIDS

1. All bids shall be made on the Bid Form which is included in the bid documents. All blanks on the Bid Form must be appropriately filled in with cost amounts. Any alterations or erasures must be

initialed by the bidder. Bid prices must be in ink or typewritten, in both words and figures. No conditions, limitations or provision may be placed on a bid.

2. Each bid must give the full business address of the bidder and be signed by the bidder with his/her usual signature. Bids (including all required supporting documents) by partnerships must be signed with the partnership name by one of the members of the partnership or by an authorized representative, followed by the signature and title of the person signing. Bids, including all required supporting documents, by corporation must be signed with the legal name of the corporation, followed by the name of the state of incorporation and by the signature and title of the president, secretary, or other person authorized to bind it in the matter. The name of each person signing shall also be typed or printed below the signature. A bid by a person who affixes to his/her signature the word "president," "secretary," "agent," or other title without disclosing his/her principal, may be held to be the bid of the individual signing. When requested by the College, satisfactory evidence of the authority of the officer signing in behalf of a corporation shall be furnished.
3. Prices should include a sufficient amount to cover the cost of any and all work or material called for in addenda to the specifications or other instructions issued during the bidding period. Such additions shall automatically become a part of the contract.
4. Prices quoted shall include freight or other charges incidental to the delivery of the item bid upon.
5. Alternate Bids and Unit Prices for the various portions of the Work or Contracts shall be as stated in other Sections of the Specifications.
6. Attention is called particularly to the requirements for filling in all Alternate Bids called for on the Proposal Form, as the Owner reserves the right to award a Contract based upon the possible inclusion of one or more such Alternate Bids. The amounts of the Alternate Bids shall include any and all modifications to related, adjacent or surrounding work made necessary by use of such Alternate Bids. The Alternate Bids must be stated as additions to or deductions from the Base Bid, unless otherwise noted.
7. The term “No Bid” shall not be used with respect to Alternate Bids requested on the Proposal Form. The Bidder who does not desire to make a change from the Base Bid under a particular Alternate Bid shall so indicate by using the words “No Change”. Failure to bid or use of the term “No Bid” on any Alternate may cause rejection of an entire bid.
8. Conditions, limitations or provisos attached by the Bidder to the Proposal may cause its rejection.
9. The College is established under the authority of the State of New Jersey and is entitled to exemption from Federal, State and local taxes, including the New Jersey Sales Tax. No amount attributable to taxes should be included in bid prices.
10. When a catalog reference follows the description of any item in the specifications, it is intended as a means of more fully describing the item in the shortest possible space and is to be regarded as part of the description of the item. Catalog numbers have been adopted from their respective sources for purposes of identification and to establish minimum requirements for quality and design. The College will consider products of manufacturers which are equal in quality and design to the items specified if such products in all ways meet the specifications. The decision of the College as to whether an alternate or substitute is in fact equal shall be final.

    After Award of Contract, any time and materials expended by the Architect and his engineers for the review of any substitutions will be charged back to Contractor in the form of Change Order.

11. Proposals shall be submitted in triplicate on the Form of Proposal furnished by the Architect properly filled out in the manner designated and duly executed, including Affidavits. Enclose one (1) original (Marked as "ORIGINAL" on the cover) and two (2) copies (Marked as "COPY" on the cover) of the Proposal. Proposal Forms shall not be altered or added to in any way. Lump sum bid or base bid prices shall be filled in, in ink or typewritten, in both words and figures. In case of discrepancy, the amount described in words shall govern.

    a. Form of Bid Proposal (Bid Form, Section 004113 Form).

    b. Certified Check or Form of Bid Bond (Section 004313 Form).

    c. Surety Disclosure Statement and Certification (Form of Proposition of Surety) (Section 004316 Form) and evidence of performance security from the prime bidder all subcontractors to whom the bidder will subcontract the work.

    d. Consent of Surety for prime bidder and/or all subcontractors to whom the bidder will subcontract the work at the time of the bid submittal (Section 004319). Note, if the General Contractor's Consent of Surety covers any or all subcontractors, then the Consent of Surety is not required for subcontractors who are covered by the General Contractor's Consent of Surety. General Contractor to provide proof at the time of bid.

    e. Subcontractor's Identification Form (Section 004336 Form).

    f. Prevailing Wage Compliance Declaration (Section 004343 Form).

    g. Hold Harmless Agreement (Section 004363 Form).

    h. Site Visit Verification (Section 004373 Form).

    i. Affidavit of Non-Collusive (Section 004519 Form), pursuant to N.J.S.A. 52:34-15.

    j. Stockholder Disclosure Certification (Section 004530 Form).

    k. No Material Change of Circumstances Affidavit (Section 004535 Form). Required for Bidder and all specialty trade sub-contractors named on the Form of Bid Proposal.

    l. Affirmative Action Language: Exhibit B and Affirmative Action Acknowledgment (Section 004536 Form).

    m. Disclosure of Investment Activities in Iran (Section 004540 Form).

    n. Contractor's Equipment Certification (Section 04550 Form).

    o. Notarized State of New Jersey Form (DBC 701) noting total amount of uncompleted contracts. Required for Bidder and all specialty trade sub-contractors named on the Form of Bid Proposal. This form may be obtained from the New Jersey Department of Treasury website under the Division of Property Management and Construction, Division Pages, Forms.

    p. Certificate by the Department of Labor indicating compliance with "The Public Works Contractor Registration Act" (P.L. 1999, c.238) for compliance with this Act. Required for Bidder and all specialty trade sub-contractors named on the Form of Bid Proposal.

    q. Proof of valid DPMC NOTICE OF CLASSIFICATION, as issued by the State of New Jersey, Department of Treasury, Division of Property Management and Construction (DPMC). Required for Bidder and all specialty trade sub-contractors named on the Form of Bid Proposal.

r. Contractor or Trade License required under applicable New Jersey Law for any trade or specialty area (applicable to plumbing, mechanical and electrical trades).

D. METHOD OF AWARD

1. Notification of the acceptance of the bid and award of the contract will be made as soon as practical after the opening of the bids. Contract will be awarded after due consideration of all factors relevant to the bidder's responsibility as well as the price, so that the College, consistent with law, will gain the advantage of a contract which in its judgment will best serve the interests of the College and the public.
2. Award made to a Bidder not a resident of the State of New Jersey is conditioned upon Bidder designating a proper agent in the State of New Jersey on whom service can be made in the event of litigation.
3. If the successful Bidder is a corporation not organized under the laws of New Jersey, the award of contract and payment of consideration there under shall be conditioned upon Corporation promptly filing a certificate of doing business in the State of New Jersey pursuant to N.J.S.A. 14A:13-2 and complying with provisions of N.J.S.A. 14A:13-4.
4. In accordance with N.J.S.A. 40A:11-1, when alternates bids are requested by the contracting unit and included as part of the contract bid package, the College intends to award the alternates bids in the order of ranking indicated, starting with alternate Bid AB-1.
5. The determination of responsive, lowest bidder shall be made by the College based upon the verification that a submitted bid package is complete, the price of the base bid, along with the price indicated for the alternate bids that are accepted by the College.
6. In accordance with N.J.S.A. 18A:64A-25.20, whenever two or more bids of equal amounts are the lowest bids submitted by responsible bidders, the Owner may award the Contract to any one of such bidders as in its discretion it may determine.
7. Within 10 days after the giving of the Notice of Award, the successful Bidder shall be required to execute the Contract with the College. The form of agreement shall be the AIA A101-2017 edition, Standard Form of Agreement between Owner and Contractor, used with the A201-2017 edition, General Conditions of the Contract for Construction.
8. Bidder acknowledges that this bid and the award of a contract are governed by the County College Contracts Law N.J.S.A. 18A:65A-25.1 et. seq. and that any legal challenges to the bidding process, the award or non-award of a contract, or the rejection of any bids, must be pursued before the Board of Trustees in accordance with P.L. 1994 Ch.48, Sec.6(f). The challenge or objection must be presented by filing a petition with the secretary of the Board of Trustees within ten (10) calendar days of the decision to award or not award a contract. Proceedings on the petition shall be governed by the Rules Governing Hearings before the Board of Trustees of Atlantic Cape Community College, which rules may be obtained at the office of the Dean of Administration and Business Services.

E. BID SECURITY

1. Each bid must be accompanied by:

a. a certified check, or a cashier's check of the bidder in the amount of 10% of the base bid amount made out to "Atlantic Cape Community College," or

b. a bid bond made payable to the College prepared and duly executed by the bidder as principal, having as a surety thereon a surety company approved by the College in the amount of 10% of the total amount of the bid.

2. The surety company on a bid bond must be acceptable to the College, authorized to transact business in New Jersey, and must be named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, U.S. Treasury Department. Where an attorney-in-fact has signed the bid bond, a certified and effectively dated copy of the power of attorney must be presented with the bond.

3. Pursuant to N.J.S.A. 18A:64A-25:18, the checks or bid bonds of all except the three lowest bidders will be returned, if requested, after ten days from opening of bids, Sundays and holidays excepted. Within three days after the award of contract and the approval of the Contractor's performance payment bond, the bid security of the remaining unsuccessful bidders will be returned, if requested, Sundays and holidays excepted.

4. The bid security of the successful bidder shall be forfeited and retained as liquidated damages if he/she neglects or refuses to execute the contract and, where applicable, furnish a performance/payment bond within ten (10) days after notice of the award of the contract. Acceptance of forfeiture by the College shall not limit the remedies available to the College upon default, and it may recover full damages including Alternate Bids, which the Owner wishes to accept and that amount for which the Owner is obligated on award to another Bidder, in addition thereto in accordance with law.

5. The proposal guarantee shall similarly be forfeited as liquidated damages if the qualification Questionnaire or Bid Affidavit required to be submitted contains a false, deceptive or fraudulent statement.

F. PERFORMANCE/PAYMENT BOND

1. Pursuant to N.J.S.A. 18A:64A-25.17, Proposals shall be accompanied by a Performance Security in form as bound in these documents, assuring that satisfactory arrangements have been made between the surety and the Bidder by which surety agrees to furnish the Bidder with a Performance Bond and Maintenance Bond to include Surety Disclosure Statement and Certification in form as bound herein. The Performance Security shall be executed by an approved surety company authorized to do business in the State of New Jersey or by the individual if an individual surety is offered by the bidder.

2. Pursuant to N.J.S.A. 18A:64A-25.25, Bidders submitting proposals for this Contract shall include Performance Security in form as bound in these documents, as hereinbefore specified.

3. The Bidder to whom the Contract has been awarded shall, within ten (10) days after notification of award of contract, furnish and deliver a Performance and Payment Bond, equal to one hundred percent (100%) of the Contract Amount. If, at any time after execution and approval of a Contract and Performance-Payment Bond required by the Contract, such Bond shall cease to be adequate security for the Owner, the Contractor shall, within five (5) days after such notice to do so, furnish a new or additional Bond, inform sum and signed by such sureties as shall be satisfactory to the Owner. No further payment shall be deemed due nor shall any further payment

be made to the Contractor unless and until such new or additional Bond be furnished and approved. Surety must be authorized to do business in the State of New Jersey.

4. Each bidder must submit with his bid a certificate from a surety company that it will provide the bidder with the bond described in paragraph F.3.

5. The surety company on a performance/payment bond must be acceptable to the College, must be authorized to transact business in New Jersey, and must be named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, U.S. Treasury Department. The surety shall comply with all provisions of N.J.S.A. 18A:64A-25.17(c) et. seq. Evidence of compliance must be submitted in the form of the "Surety Disclosure Statement and Certification" which must be included with the bid. Failure to submit this statement will result in rejection of the bid.

6. Where an attorney-in-fact has signed the performance/payment bond, a certified and effectively dated copy of the power of attorney must be presented with the bond.

7. Prior to the start of the guarantee period and before the final payment is made, the Contractor shall provide the Owner with a Maintenance Bond in the amount of ten percent (10%) of the Final Contract Amount, to insure the replacement or repair of defective materials or workmanship during the one-year guarantee period.

8. The cost of all Bonds shall be paid for by the Contractor.

9. Attorneys-in-fact who sign Bid Bonds, Performance-Payment Bonds, Maintenance Bonds and Performance Security forms must accompany each bond or proposition with a certified and effectively dated copy of their power-of-attorney.

G. IRREVOCABLE LETTER OF CREDIT

1. At the time set for signing the contract, the successful bidder may deliver an Irrevocable Letter of Credit (in lieu of the Performance/Payment Bond) in the amount of 100% of the accepted bid on the forms included in the RFP. The premium for such letter shall be paid by the bidder and will be part of the price quoted in the bid.

H. PERFORMANCE OF CONTRACT

1. Failure of a bidder to execute a contract awarded to him/her, or to comply with any or all of the terms and conditions thereof, may disqualify him/her from receiving future contracts. Such disqualification or the failure to disqualify shall not limit the remedies available to the College upon default and it may recover full damages in addition thereto in accordance with law.

2. Insofar as possible and if applicable, the successful bidder in carrying out the contract must employ such methods or means as will not cause any interruption of, or interference with, the work of any other contractor or any of the customary operations of the College.

3. Bidders shall acquaint themselves with the conditions to be found at the College and shall assume all responsibility for the performance of the contract. The College will not accept deliveries for contractors.

4. Successful bidders will guarantee:

a. to furnish adequate protection for all work and to repair damage of any kind for which they or their agents or employees are responsible;

b. to carry adequate insurance, as required by General and Supplementary Conditions, to protect the College from any and all claims on behalf of any person, firm or corporation arising out of any action or work performed by the successful bidders or their agents, or employees relating to the performance of the contract.

5. Indemnification.

a. The successful bidder shall indemnify and hold harmless the College and its agents and employees from and against all claims, damages, losses and expenses including attorneys' fees arising out of or resulting from the performance of the contract, provided that any such claim, damage, loss or expense

1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property including the loss of use resulting therefrom, and

2) is caused in whole or in part by any negligent act or omission of the successful bidder, any subcontractor of the successful bidder, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

b. With respect to claims against the College by an employee of the successful bidder, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable the indemnification obligation under this paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the successful bidder or any subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

c. The College may deduct amounts due to it under paragraph H.6 of this document from any sum or sums which may be due to the successful bidder under the contract.

6. The College agrees to make payment for the performance of the contract, subject to additions and deductions, within 60 days after performance has occurred and been found in compliance with the contract. Title to all supplies, materials and equipment shall pass to the College at the time of said payment.

7. Neither the final certificate of payment nor any provision in the bid documents or contract nor partial or entire use of the equipment, supplies or services by the College shall constitute an acceptance thereof if not in accordance with the specifications and other documents included in the RFP, nor relieve the successful bidder of liability in respect to any express warranties or for faulty materials or workmanship. The successful bidder will agree to promptly remedy, without cost to the College, any defect which shall appear within a period of one year from the date of final acceptance if a standard manufacturer's warranty does not apply, unless a longer period is specified or allowed by the manufacturer. The College will give notice of observed defects with reasonable promptness.

8. The work is to be completed as per the schedule indicated in Specification Section 011000 Summary.

I. INSURANCE

1. Before commencing the work, each Contractor shall procure and maintain until completion and final acceptance of the work and shall cause each subcontractor to so procure and maintain, at least the following insurance:
    a. Worker's Compensation and Employer's Liability. Worker's Compensation (statutory limits) and Employer's Liability Insurance with a limit of $500,000.00 covering each and every worker employed in connection with the work under contract, as provided for in each and every State and Federal statute applicable to Worker's Compensation.
    b. Comprehensive General Liability. Comprehensive General Liability Insurance covering work under the contract (including premises/operations, products/completed operations, independent contractors, personal injury, broad form property damage and contractual liability coverage) with at least the following limits:
        1) Bodily Injury and Personal Injury: $1,000,000.00 per occurrence.
        2) Property Damage: $1,000,000.00 per occurrence.
    c. Comprehensive Auto Liability. Comprehensive Auto Liability insurance covering all owned, hired and non-owned vehicles with at least the following limits of liability:
        1) Bodily Injury: $1,000,000.00 per occurrence.
        2) Liability: $1,000,000.00 per occurrence.
        3) Property Damage Liability: $1,000,000.00 per occurrence.
2. Excess Liability Limits. Excess Liability coverage for personal injury and property damage shall be provided by the Contractor with a minimum limit of liability of $5,000,000.00.
3. Contractors may carry whatever additional insurance deemed necessary to protect themselves against hazards not covered by the Owner's Property Insurance, including coverage for theft, collapse, water damage, materials and equipment stored on site, and for materials and equipment stored off site, and against loss of owned or rented equipment and tools owned by mechanics or any tools, equipment, scaffolding, staging, towers and forms owned or rented by the Contractor, the value of which is not included in the cost of the work. Owner's "All Risk" Insurance does not cover theft of material unless installed and made an integral part of the building.
4. Subcontractors: Contractors shall require all their subcontractors to provide the aforementioned coverage as well as any other coverage that the Contractors may consider necessary and any deficiencies in their coverage and policy limits will be the sole responsibility of the contractors.
5. Certificates of Insurance. Before commencing operations, Contractor shall furnish to Owner a Certificate of Insurance evidencing:
    a. The required coverage and limits written through an insurance company or companies acceptable to the Owner.
    b. The effective and expiration dates of the policies.
    c. Thirty (30) days written notice of cancellation or material change in any policies.
    d. That a Waiver of Subjugation endorsement has been attached to all policies.
    e. The fact that the Contractor's policies are primary insurance.
    f. The contract number.

g. That Atlantic Cape Community College and their agents, and the Architect and their agents, are listed as additional insured.

6. Waiver of Subjugation: All insurance policies of the Contractor will be endorsed to waive all right of subjugation against the Owner.

7. The Owner as trustee shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within five (5) days after the occurrence of the loss to the Owner's exercise of this power. The Owner as trustee shall, in that case, make settlement with the insurer.

8. Cancellation, Reduction, or Non-Renewal: If the insurance policies required herein are cancelled, or the coverage is reduced below the minimum specified, or expiration without renewal occurs before completion of the work, the Owner, at this option, may obtain the said certificates or policies, and charge the cost against money due the Contractor pursuant to the terms of this contract.

9. Builder’s Risk Insurance: The Contractor shall be required to secure and maintain Builder’s Risk Insurance for the project. Refer to Specification Section 006230 Supplementary Conditions for additional information.

J. UNION LABOR

1. Atlantic Cape Community College encourages Union Labor participation on all construction projects, and encourages bidders to contact the local labor union representatives to discuss the potential for the inclusion of union labor on projects.

END OF SECTION 002113

DOCUMENT 003119 - EXISTING CONDITION INFORMATION

1.1 EXISTING CONDITION INFORMATION

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. Site Utility Location Services have been contracted for by the Atlantic Cape community College and the findings enclosed;

1. Site Utility Location Job summary (3 Pages)
2. Site Utility Location Field Service Report (2 Pages)
3. Site Utility Location Plan (1 Page)

C. Existing drawings that include information on existing conditions including previous construction at Project site are available for viewing at the office of Owner.

D. Survey information that includes information on existing conditions is available for viewing at the office of Owner.

E. Related Requirements:

1. Document 003132 "Geotechnical Data" for reports and soil-boring data from geotechnical investigations that are made available to bidders.

END OF DOCUMENT 003119

GPRS SUBSURFACE SCANNING SOLUTIONS

Job Summary

Job Date : 4/30/2020

Customer	ATLANTIC CAPE COMMUNITY COLLEGE	**Phone Number**	(609) 343-6811

Billing Address	City	State	Zip
5100 E BLACK HORSE PK	MAYS LANDING	NJ	08330

Job Details

Jobsite Location	5100 E Black Horse Pk
City	Mays Landing
State	NJ

WA Number	191563
Job Num	
PO Num	

Lead Technician	BAXTER, ALI	**Phone**	484-757-4721	**Email**	ali.baxter@gprsinc.com

Thank you for using GPRS on your project. We appreciate the opportunity to work with you. If you have questions regarding the results of this scanning, please contact the lead GPRS technician on this project.

EQUIPMENT USED

The following equipment was used on this project:

- Underground Scanning GPR antenna. Typically capable of detecting objects up to 8' deep or more in ideal conditions but maximum effective depth can vary widely and depends on site and soil conditions. Depth penetration is most commonly limited by moisture and clay/conductive soils.

Work Performed

Ground Penetrating Radar Systems performed the following work on this project:

Underground Utility

The scope of work included scanning the specified area to locate underground utilities. A tracer signal was sent along any accessible metallic utility or tracer wire, and the area was scanned with GPR to locate any additional targets. The locations of any detected utilities and anomalies were marked directly at the site with paint, flags, stakes, or other appropriate means, and results were reviewed with onsite personnel unless otherwise noted.

- Located utilities from back of guard's booth to building scope painted in white(only located guard's booth utilities in grass area) most concerned about area up to curb.
- The effective depth of GPR will vary throughout a site depending on surface and soil conditions. In this area, the maximum effective GPR depth was approximately 5 feet.

GPRS SUBSURFACE SCANNING SOLUTIONS

Job Summary

Job Date : 4/30/2020

- NOTES
  THERE ARE MULTIPLE UTILITIES INSIDE GRASS AREA THAT WAS NOT LOCATED ED WAS NOT INTERESTED IN LOCATING THOSE UTILITIES HE WAS MORE CONCERNED WITH UTILITIES FROM CURB TO BACK OF GUARD'S BOOTH THERE ARE MULTIPLE WATER LINES AND ELECTRIC

  LOST SIGNAL FOR GAS LINE FROM GUARD'S BOOTH X FOR LAST LOCATABLE SIGNAL LINE CONTINUES

  LOCATED A UNKNOWN UTILITY USING BUILDING SEARCH COULD NOT LOCATE TO A SURFACE FEATURE X FOR LAST LOCATABLE SIGNAL

  ALSO FOUND A UNKNOWN LINE USING GPR

  SEWER LINE AND WATER LINE WAS LOCATED BY DUCT RODDING EMPTY CONDUITS THATS IN A COMMON TRENCH SUGGEST BEING VERY CAREFUL NEAR THESE UTILITIES THERE THERE IS A FIBER LINE IN TRENCH THAT COULD NOT BE LOCATED POSSIBLY IN SAME TRENCH

  EMPTY ELECTRIC BOX IN SCOPE

  ONE CALL LOCATED MAIN GAS LINE I CONFIRMED LINE

  Scope marked in white paint

Pictures

Utility Limitations

TERMS & CONDITIONS

http://www.gprsinc.com/termsandconditions.html

GPRS SUBSURFACE SCANNING SOLUTIONS

Job Summary

Job Date : 4/30/2020

SIGNATURE

Contact Name

Ed Perkins (609) 343-6811 eperkins@atlantic.edu

Field Service Report

*Formal invoice to follow

master locators
675 Concord Road Glen Mills, PA
1-800-495-4248
www.masterlocators.com

Company:
Atlantic Cape Community College

Project:
ACCC Security Bldg

Customer Contact:
Edward Perkins

ML Job#:
ML-042420-03103

Lead Technician:
Ali Baxter

Field Assistant:

Site Address:
5100 E Black Horse Pike

Project Coordinator:
Brian Sloan

Date:	Tech#:	STD Hours:	OT Hours:	Begin:	Onsite:	Offsite:	End:
04-30-2020		4	0	06:00 AM	07:15 AM	02:30 PM	03:30 PM

Services Performed :(Check all that apply)

- ◯ GPR Survey
- ◯ Concrete Scan
- ◯ Lead Detection - Helium
- ◯ Other
- ◯ EM Scan
- ◯ CCTV Pipe Inspection
- ◯ Fault Locate
- ◯ Air/Hydro Excavation
- ◯ Leak Detection - Acoustic
- ◯ Surveying & Mapping

Soil Conditions: (Check all that apply)

- ◯ Saturated
- ◯ Sand
- ◯ Dry
- ◯ Other
- ◯ Clay

Weather Conditions: (Check all that apply)

- ◯ Clear
- ◯ Snow
- ◯ Overcast
- ◯ Other
- ◯ Rain

Utilities Features Designated: (Check all that apply)

- ◯ Gas
- ◯ Fiber Optic
- ◯ Sewer
- ◯ Unknown
- ◯ Water
- ◯ Comm
- ◯ Rebar
- ◯ None
- ◯ Electric
- ◯ Storm
- ◯ UST
- ◯ Other

Deliverable Request : (Check all that apply)

- ◯ Plan Mark Up
- ◯ Sketch
- ◯ Engineering Report
- ◯ Other
- ◯ CAD Update

Deliverable Provided Onsite : No

Survey Methodologies:

Known Utilities:

- ◯ Utilities within Scope of Work:
- ◯ Utilities outside Scope of Work:
- ◯ Building Feeds:

UnKnown Utilities:

- ◯ Passive Scans:
- ◯ Split Box Scans:
- ◯ GPR Scans:

(Grid Spacing):

Other Survey Methodology:

Full Scope of Work:

Located utilities from back of guardâ s booth to building scope painted in white(only located guardâ s booth utilities in grass area) most concerned about area up to curb.

Additional Resources:

Result And Notes:

NOTES THERE ARE MULTIPLE UTILITIES INSIDE GRASS AREA THAT WAS NOT LOCATED ED WAS NOT INTERESTED IN LOCATING THOSE UTILITIES HE WAS MORE CONCERNED WITH UTILITIES FROM CURB TO BACK OF GUARD'S BOOTH THERE ARE MULTIPLE WATER LINES AND ELECTRIC LOST SIGNAL FOR GAS LINE FROM GUARD'S BOOTH X FOR LAST LOCATABLE SIGNAL LINE CONTINUES LOCATED A UNKNOWN UTILITY USING BUILDING SEARCH COULD NOT LOCATE TO A SURFACE FEATURE X FOR LAST LOCATABLE SIGNAL ALSO FOUND A UNKNOWN LINE USING GPR SEWER LINE AND WATER LINE WAS LOCATED BY DUCT RODDING EMPTY CONDUITS THATS IN A COMMON TRENCH SUGGEST BEING VERY CAREFUL NEAR THESE UTILITIES THERE THERE IS A FIBER LINE IN TRENCH THAT COULD NOT BE LOCATED POSSIBLY IN SAME TRENCH EMPTY ELECTRIC BOX IN SCOPE ONE CALL LOCATED MAIN GAS LINE I CONFIRMED LINE

Client Communication:

Recommended Services: (Check all that apply)

- ◯ GPR Survey
- ◯ Concrete Scan
- ◯ Leak Detection - Helium
- ◯ Other
- ◯ EM Scan
- ◯ CCTV Pipe Inspection
- ◯ Fault Locate
- ◯ Air/Hydro Excavation
- ◯ Leak Detection - Acoustic
- ◯ Surveying & Mapping

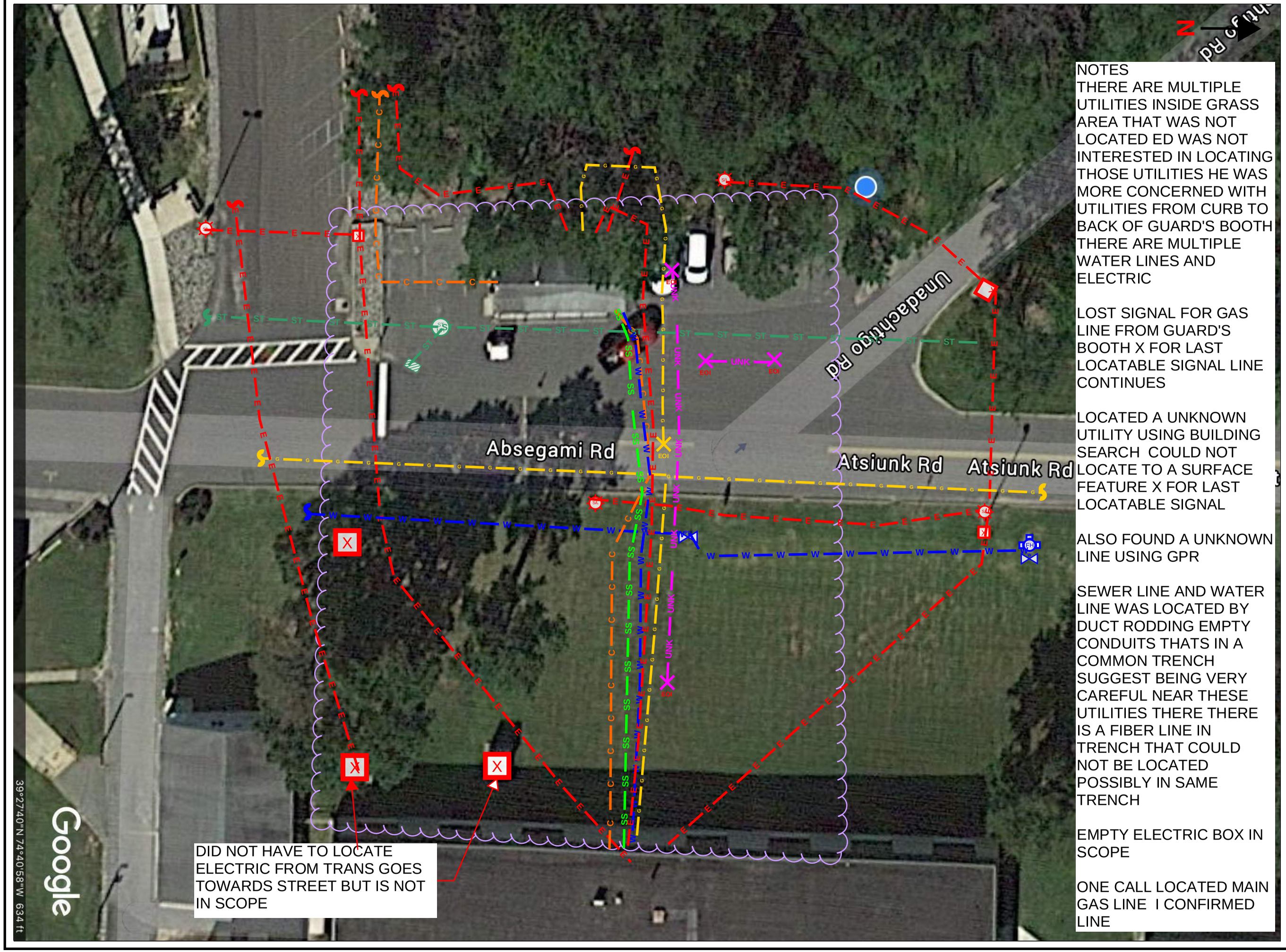
Client PO# : P0025388

Fieldwork Complete: YES

Date: 04-30-2020 03:30 PM

Contacts on Site:

Signature:



NOTES

THERE ARE MULTIPLE UTILITIES INSIDE GRASS AREA THAT WAS NOT LOCATED ED WAS NOT INTERESTED IN LOCATING THOSE UTILITIES HE WAS MORE CONCERNED WITH UTILITIES FROM CURB TO BACK OF GUARD'S BOOTH THERE ARE MULTIPLE WATER LINES AND ELECTRIC

LOST SIGNAL FOR GAS LINE FROM GUARD'S BOOTH X FOR LAST LOCATABLE SIGNAL LINE CONTINUES

LOCATED A UNKNOWN UTILITY USING BUILDING SEARCH COULD NOT LOCATE TO A SURFACE FEATURE X FOR LAST LOCATABLE SIGNAL

ALSO FOUND A UNKNOWN LINE USING GPR

SEWER LINE AND WATER LINE WAS LOCATED BY DUCT RODDING EMPTY CONDUITS THATS IN A COMMON TRENCH SUGGEST BEING VERY CAREFUL NEAR THESE UTILITIES THERE THERE IS A FIBER LINE IN TRENCH THAT COULD NOT BE LOCATED POSSIBLY IN SAME TRENCH

EMPTY ELECTRIC BOX IN SCOPE

ONE CALL LOCATED MAIN GAS LINE I CONFIRMED LINE

master locators
800.495.4248
info@masterlocators.com
www.masterlocators.com

Site Name and Location:

Atlantic Cape Community College
5100 E Black Horse Pk, Mays Landing, NJ 08330

Assumptions & Clarifications

1. UNLESS OTHERWISE NOTED UNDERGROUND UTILITY DATA IS CONSIDERED QUALITY LEVEL B (QLB) AS DEFINED IN ASCE 38-02: STANDARD GUIDELINE FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA AND IS INTENDED TO SHOW THE APPROXIMATE HORIZONTAL LOCATIONS OF EXISTING UNDERGROUND UTILITIES AS MARKED BY MASTER LOCATORS DURING A GEOPHYSICAL INVESTIGATION PERFORMED WITHIN THE OUTLINED SCOPE OF WORK.

2. ALL UTILITY LOCATIONS SHOWN ON THIS PLAN ARE FOR REFERENCE ONLY. THIS PLAN SHOULD NOT BE USED FOR CONSTRUCTION OR DESIGN PURPOSES AND MASTER LOCATORS IS NOT RESPONSIBLE FOR DAMAGE TO UTILITIES RESULTING FROM ANY CONSTRUCTION WORK BASED ON THESE PLAN.

3. NO BOUNDARY OR PROPERTY SURVEY WORK WAS CONDUCTED IN THE DEVELOPMENT OF THIS PLAN. THE PLAN IS NOT DRAWN TO SCALE.

4.ANY DEPTH INFORMATION PROVIDED IS CONSIDERED APPROXIMATE AND IS NOT GUARANTEED UNLESS LABELED AS QUALITY LEVEL A (QLA) DATA.

Legend & Color Codes

Electric (E) — Unknown (UNK) — Water (W)
Comms. (C) — Storm (ST) — Sanitary (SS)
Gas (G)

Man Hole (MH) — Valve — Continuation Mark — End of Information (EOI) — Scope of Work
Bollard (B) — Utility Pole (U/P) — Clean Out (C/O) — Storm Drain — Roof Drain (R/D)
Floor Drain (F/D) — Test Hole — Fire Hydrant (FH) — Irrigation Box (W)
Site Light (S/L) — Transformer (X) — Electric Box (E) — Phone Pedestal (P)
Large (>12") Storm Line — Flow Direction — Buried Vault (BV) — Witness Post (WP)

Revisions:

Date:	Description:	By:

ML Job #:
Date: 4-30--20
Technician(s): Ali Baxter
Client Name:

SECTION 004113 - FORM OF PROPOSAL (BID FORM)

PROPOSAL OF _____ hereinafter called "BIDDER," a/an

☐ corporation

☐ partnership (check applicable term)

☐ individual

organized and existing under the laws of the State of _____and doing business

as _____.

Bidder's Address: _____

_____

_____

Bidder's Phone Number: _____

TO: BOARD OF TRUSTEES OF ATLANTIC CAPE COMMUNITY COLLEGE
5100 Black Horse Pike
Mays Landing, New Jersey 08330 (hereinafter called College.")

Members of the Board:

1. The bidder, in compliance with your Legal Notice inviting bids for the Bid of the NEW PUBLIC SAFETY BUILDING AT THE MAYS LANDING, CAMPUS, located at 5100 Black Horse Pike in Mays Landing, New Jersey for the Atlantic Cape County Community College, having examined the specifications, drawings, Request for Proposal, various forms and related contract documents and the site of the proposed work and being familiar with all the conditions surrounding the proposed contract or the proposed construction, including the availability of materials and labor, hereby proposes to furnish and/or install the equipment, labor, materials and supplies and/or to construct the project in accordance with all the aforesaid documents within the time set forth therein and at the prices stated below. These prices are to cover all expenses incurred in supplying and/or installing the materials and equipment or performing the work required by the Request for Proposal of which this Bid Form is a part.

2. The bidder acknowledges receipt of the following Addenda:

Addendum No._____ Dated: _____

Addendum No._____ Dated: _____

Note: Failure to acknowledge all issued Addenda is a material defect to the bid.

3. The bidder agrees to deliver and/or install the materials and equipment and complete the project as described in the contract documents for the Base Bid Sum (words and numbers) of:

Prime Bidders shall be DPMC Classified for trades C008 (General Construction) or C009 (General Construction/Alterations and Additions). Provide proof of valid DPMC Notice of Classification, Total Amount of Uncompleted Contracts, (Form DBC-701), the Certification of No Material Adverse Change in Status Affidavit, Proposition of Surety, Consent of Surety and Trade License (when applicable) for the prime bidder and the listed subcontractors at the time of the bid submittal. Provide all subcontractor information per 18A:64A-25.25.

SINGLE OVERALL CONTRACT:

BASE BID _____ Dollars
(To Be Written in Full)

($_____)
(Figures)

ALLOWANCES (TO BE INCLUDE IN THE BASE BID):

ALLOWANCE No. 1: CONTINGENCY ALLOWANCE

Contractor to include **Fifty Thousand Dollars ($50,000.00)** in its base bid proposal to address unforeseen conditions that may be encountered during the course of the construction. Prior to commencing with any work to be billed against this allowance, the Contractor must submit pricing information for review and consideration and receive written direction to proceed from the Architect. Any excess allowance not used at substantial completion will be deducted from the contract. The Contractor shall submit tickets and receipts to substantiate costs incurred for allowance work. This is to be identified as an Allowance on the successful contractor's schedule of values.

ALLOWANCE No. 2: COLD WEATHER ALLOWANCE

Contractor to include **Ten Thousand Dollars ($10,000.00)** in its base bid proposal to address the potential need for cold weather protective measures during the construction of the project. Prior to commencing with any work to be billed against this allowance, the Contractor must submit a plan and pricing information for review and consideration and receive written direction to proceed from the Architect. Any excess allowance not used at substantial completion will be deducted from the contract. This is to be identified as an Allowance on the successful contractor's schedule of values.

ALTERNATE BIDS:

AB-1: **Provide Ballistics Resistant Material at Control Room 101;**
State amount to be "ADDED TO" the base bid to provide all work and cost associated with installing ballistics rated wall liner panels and transaction window at Control Room 101 as indicated on the Contract Documents. The scope of this alternate shall include all necessary preparation, material, labor, accessories, and features for complete and warranted installation of work.

ADD: $ _____ Dollars
(To Be Written in Full)

($_____)
(Figures)

NOTE: If written amount differs from the Numerical Figures, only the Written amount will be accepted as the correct BID. No conditions, limitations or provision may be placed on a bid.

4. The bidder understands that the College reserves the right to reject for any reason any and all bids and to waive any informalities in the bidding.

5. The bidder agrees that this bid shall be good and may not be withdrawn for a period of 60 days after the actual opening of the bids.

6. Within 10 days after receipt of written notice of acceptance of this bid and the award of the contract, the bidder will execute the contract with the College, and will deliver a performance payment bond and insurance certificate required by the RFP.

7. The bidder hereby certifies that all of the figures, computations and additions used in estimating the bid herein have been carefully checked and are accurate in all respects, and no claim shall be made as the basis for withdrawal of this bid after opening on the grounds of mathematical error.

8. The Forms noted below are part of the Bid package and must be properly completed and submitted with Bid Proposal. Failure to provide any items noted below may cause disqualification of Bid Proposal in accordance with the law. Proposals shall be submitted in triplicate on the Form of Proposal furnished by the Architect properly filled out in the manner designated and duly executed, including Affidavits. Enclose one (1) original and two (2) copies of the Proposal. Proposal Forms shall not be altered or added to in any way.

a. Form of Bid Proposal (Bid Form, Section 004113 Form).

b. Certified Check or Form of Bid Bond (Section 004313 Form).

c. Surety Disclosure Statement and Certification (Form of Proposition of Surety) (Section 004316 Form) and evidence of performance security from the prime bidder all subcontractors to whom the bidder will subcontract the work.

d. Consent of Surety for prime bidder and/or all subcontractors to whom the bidder will subcontract the work at the time of the bid submittal (Section 004319). Note, if the General Contractor's Consent of Surety covers any or all subcontractors, then the Consent of Surety is not required for subcontractors who are covered by the General Contractor's Consent of Surety. General Contractor to provide proof at the time of bid.

e. Subcontractor's Identification Form (Section 004336 Form)

f. Prevailing Wage Compliance Declaration (Section 004343 Form).

g. Hold Harmless Agreement (Section 004363 Form).

h. Site Visit Verification (Section 004373 Form).

i. Affidavit of Non-Collusive (Section 004519 Form).

j. Stockholder Disclosure Certification (Section 004530 Form).

k. No Material Change of Circumstances Affidavit (Section 004535 Form). Required for Bidder and all specialty trade sub-contractors named on the Form of Bid Proposal.

l. Affirmative Action Language: Exhibit B and Affirmative Action Acknowledgment (Section 004536 Form).

m. Disclosure of Investment Activities in Iran (Section 004540 Form).

n. Contractor's Equipment Certification (Section 04550 Form).

o. Notarized State of New Jersey Form (DBC 701) noting total amount of uncompleted contracts. Required for Bidder and all specialty trade sub-contractors named on the Form of Bid Proposal. This form may be obtained from the New Jersey Department of Treasury website under the Division of Property Management and Construction, Division Pages, Forms.

p. Certificate by the Department of Labor indicating compliance with "The Public Works Contractor Registration Act" (P.L. 1999, c.238) for compliance with this Act. Required for Bidder and all specialty trade sub-contractors named on the Form of Bid Proposal.

q. Proof of valid DPMC NOTICE OF CLASSIFICATION, as issued by the State of New Jersey, Department of Treasury, Division of Property Management and Construction (DPMC). Required for Bidder and all specialty trade sub-contractors named on the Form of Bid Proposal.

r. Contractor or Trade License required under applicable New Jersey Law for any trade or specialty area (applicable to plumbing and electrical trades).

Written Signature: _____

Printed/Typed Signature: _____

Title: _____

Name of Firm: _____

Address: _____

Telephone Number: _____ Fax Number _____

E-Mail Address: _____ Taxpayer Federal ID Number _____

NOTE: DO NOT FAIL TO EXECUTE THIS OATH OR AFFIDAVIT:

AFFIDAVIT

STATE OF _____)

SS:

COUNTY OF _____)

_____

(Name of Bidder or Bidders, or if Bidder is a corporation, name of Officer or Agent making Affidavit.)

being duly sworn, says that the several declarations and matters stated in the annexed estimate are in all respects true.

I hereby certify that I am the _____ of the bidder submitting this proposal and that I am authorized to submit this bid on behalf of the bidder and that the information contained in all bidding documents submitted by the bidder is true and accurate. I further certify that the bidder and all subcontractors listed herein have sufficient means and experience to complete the work in accordance with the project specifications. I am aware that if any of the foregoing statements made by me are willfully false, I am subject to punishment.

Signature of:

_____
(Bidder, if Bidder is an Individual)

_____
(Partner, if Bidder is a Partnership)

_____
(Officer, if Bidder is a Corporation)

Sworn and subscribed before me this

_____ day of _____ 20 ____.

NOTARY PUBLIC _____
(Signature)

_____
(Print Name)

SEAL

Notary Public - State of _____

My Commission Expires _____

END OF FORM OF PROPOSAL 004113

SECTION 004313 - FORM OF BID BOND

WE, THE UNDERSIGNED_____, a/an

☐ Corporation

☐ Partnership (check applicable term)

☐ Individual

as Principal and_____, as Surety, are held firmly bound unto Atlantic Cape Community College, as Owner, in the penal sum of $ _____, for the payment of which we hereby jointly and severally bid ourselves, our heirs, executors, administrators, successors and assigns.

THE CONDITION OF THE ABOVE OBLIGATION is such that whereas the Principal has submitted to Mercer County Community College a certain Bid, attached hereto and hereby made apart hereof, to enter into a contract in writing, for the:

NEW PUBLIC SAFETY BUILDING
AT THE
MAYS LANDING CAMPUS
Atlantic Cape Community College
Mays Landing, New Jersey 08330

NOW THEREFORE,

(a) If said Bid shall be rejected, or in the alternate,

(b) If said Bid shall be accepted and the Principal shall execute and deliver a contract, properly completed in accordance with said Bid, and shall furnish a bond for the faithful performance of said contract and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other 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.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Owner may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunder set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by the proper officers, this

_____day of _____, 20_____.

(continued on next page)

ATTEST:

Principal: _____ (L.S.)

Surety: _____ By: _____

STATE OF)
: SS:
COUNTY OF)

On this _____ day of _____ 20 ___, before me personally came

_____ to me known, who, being by me duly sworn, did dispose and say;

he resides in _____ that he is the _____

of the instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said corporation, and that he signed his name thereto by like order.

(SEAL)

_____

Notary Public of _____

My Commission expires _____

END SECTION 004313

SECTION 004316 - SURETY DISCLOSURE STATEMENT AND CERTIFICATION

_____surety(ies) on the attached bond, hereby certifies(y) the following:

1. The surety meets the applicable capital and surplus requirements of R.S. 17:17-6 or R.S. 17:17-7 as of the surety's most current annual filing with the New Jersey Department of Insurance.

2. The capital (where applicable) and surplus, as determined in accordance with the applicable laws of this State, of the surety(ies) participating in the issuance of the attached bond is (are) in the following amount(s) as of the calendar year ended December 31, _____(most recent calendar year for which capital and surplus amounts are available), which amounts have been certified as indicated by certified public accountants (indicating separately for each surety that surety's capital and surplus amounts, together with the name and address of the firm of certified public accounts that shall have certified those amounts):

_____
_____
_____

3. (a) With respect to each surety participating in the issuance of the attached bond that has received from the United States Secretary of the Treasury a certificate of authority pursuant to 31 U.S.C. 9305, the underwriting limitation established therein and the date as of which that limitation was effective is as follows (indicating for each such surety that surety's underwriting limitation and the effective date thereof):

_____
_____
_____

(b) With respect to each surety participating in the issuance of the attached bond that has not received such a certificate of authority from the United States Secretary of the Treasury, the underwriting limitation of that surety as established pursuant to R.S.17:18-9 as of (date on which such limitation was so established) is as follows (indicating for each such surety that surety's underwriting limitation and the date on which that limitation was established):

_____
_____
_____

4. The amount of the bond to which this statement and certification is attached is $_____.

5. If, by virtue of one or more contracts of reinsurance, the amount of the bond indicated under item (4) above exceeds the total underwriting limitation of all sureties on the bond as set forth in items (3)(a) or (3)(b) above, or both, then for each such contract of reinsurance:

(continued on next page)

(a) The name and address of each such reinsurer under that contract and the amount of that reinsurer's participation in the contract is as follows:

_____
_____
_____

(b) Each surety that is party to any such contract of reinsurance certifies that each reinsurer listed under item 5(a) satisfies the credit for reinsurance requirement established under P.L.1993, c.243 (C.17:51B-1 et seq.) and any applicable regulations in effect as of the date on which the bond to which this statement and certification is attached shall have been filed with the appropriate public agency.

(continued on next page)

CERTIFICATE
(to be completed by an authorized certifying agent for each surety on the bond)

I_____(name of agent), as

_____(title of agent), for

_____(name of surety),

a

☐ Corporation

☐ Mutual insurance company (check one)

☐ Other

(indicating type of business organization) domiciled in _____(state of domicile),

DO HEREBY CERTIFY that, to the best of my knowledge, the foregoing statements made by me are true, and ACKNOWLEDGE that, if any of those statements are false, this bond is VOID.

Signature of certifying agent:

_____

Printed name of certifying agent:

_____

Title of certifying agent:

_____

Amended by L.1995, c.384 & 3,eff. Jan. 10, 1996; Section N.J.S.A. 18A:64A-25.17

END OF SECTION 004316

SECTION 004319 - ATLANTIC CAPE COMMUNITY COLLEGE CONSENT OF SURETY

A performance bond will be required from the successful bidder, including all subcontractors, on this project as N.J.S.A. 18A:64A-25.25 requires, and consequently, all bidders/vendors, including all subcontractors, shall submit, with their bid, a consent of surety in substantially the following form:

To: _____
(Owner – Atlantic Cape Community College)

Re: _____
(Bidder/Vendor)

(Project Description)

This is to certify that the _____ will provide to
(Surety Company)

_____ a performance bond in the full amount of the awarded contract in
(Owner)
the event that said vendor is awarded a contract for the above project.

_____
(Bidder/Vendor)

_____
(Authorized Agent of Surety Company)

Date: _____

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

THE CONTRACTOR MAY PROVIDE BONDING ON BEHALF OF THE SUBCONTRACTORS.

END OF SECTION 004319

SECTION 004336 - SUBCONTRACTOR'S IDENTIFICATION FORM

County College Contracts Law, N.J.S.A. 18A:64A-25.25, provides that Bidders on public building projects shall provide the name or names of, and evidence of performance security from, all subcontractors to whom the bidder will subcontract the work, including plumbing and gas fitting work; heating and ventilating systems and equipment; electrical work; structural steel and ornamental iron work; all other work and materials required for the completion of the project.

Public Law P.L. 2009, c.315 - Business Registration Certificate requires that all contractors submitting bid proposals for contract work must have their business registered with the New Jersey Department of Treasury in order to contract for public work. No less than ten (10) business days prior to award of contract approved by the College's Board of Trustees, the bidder shall submit a copy of its Business Registration Certificate issued by the New Jersey Department of Treasury, Division of Revenue. The bidder has to have obtained the Business Registration Certificate prior to receipt of bids.

These Contract Documents also require the Bidder to provide the name, address, and description of work to be performed by all subcontractors.

Name of Bidder: _____

Prime Bidders shall be DPMC Classified for trades C008 (General Construction) or C009 (General Construction/Alterations and Additions).

For each prime subcontractor listed below, you are required to provide the following at the time of bid;

- Provide proof of valid DPMC Notice of Classification
- Total Amount of Uncompleted Contracts, (Form DBC-701)
- Certification of No Material Adverse Change in Status Affidavit
- Proposition of Surety*
- Consent of Surety*
- Trade License (as applicable for trade)

*Consent of Surety for subcontractors must be provided with the bid submission, unless the General Contractor's Consent of Surety covers any or all subcontractors. In this case, the Consent of Surety is not required for subcontractors who are covered by the General Contractor's Consent of Surety. General Contractor must provide proof at the time of bid.

The Business Registration Certificate shall be provided as per the timeline indicated in the Information for Bidders – Section 002113.

Provide all other required subcontractor information per 18A:64A-25.25 and as indicated on the Form of Bid Proposal.

(continued on next page)

The undersigned Bidder declares that the following firms will be used as subcontractors to complete certain portions of the work in this project (write "self-performed" if Prime Bidder is executing work):

Subcontractor Name and Address	Nature of Work
	Electrical C047 (if not self-performed)
	Plumbing C030 (if not self-performed)
	HVAC C039 (if not self-performed)
	Site Work (C054) (if not self-performed)

ATTACH ADDITIONAL SHEETS IF NECESSARY.

Signature of Bidder's authorized representative:

Signature: _____

Title: _____

Date: _____

END OF SECTION 004336

SECTION 004343 - PREVAILING WAGE COMPLIANCE DECLARATION - SECTION III

To: Atlantic Cape Community College

Re: NEW PUBLIC SAFETY BUILDING
MAYS LANDING CAMPUS
Atlantic Cape Community College
Atlantic County, Mays Landing, New Jersey

The Contractor hereby agrees to comply in all respect with the New Jersey Prevailing Wage Act, Chapter 150, P.L. 1963 as amended. A copy of the prevailing wage rates pertaining to the work and issued by the New Jersey Department of Labor and Industry entitled, "Prevailing Wage Rate Determination," is on file in the Owner's office or may be obtained from the New Jersey Department of Labor and Industry. For job categories not covered under prevailing wage rates, bidders are required to pay to workers at least the legally established minimum wage at all times during the contract period. In the event it is found that any worker employed by the Contractor or any Subcontractor covered by the contract herein has been paid a rate of wages less than the prevailing rate required to be paid by such contract, the Owner may terminate the Contractor's or Subcontractor's right to proceed with the work or such part of the work as to which there has been a failure to pay required wages and to prosecute the work to completion or otherwise. The Contractor and his sureties shall be liable to the Owner for any excess costs occasioned thereby.

Before final payment is made by or on behalf of the Owner of any sum or sums due to the work, the Contractor or Subcontractor shall file with the Owner, written statements in form satisfactory to the commissioner of Labor and Industry certifying to the amounts then due and owing from such contractor or subcontractor filing such statement to any and all workmen for wages due on account of the work, setting forth therein the names of the persons whose wages are unpaid and the amount due to each respectively which statement shall be certified by the oath of the Contractor or Subcontractor as the case may be in accordance with the said New Jersey Prevailing Wage Act.

The prevailing wage rate shall be determined by the Commissioner of Labor and Industry or his duly authorized deputy or representative.

The undersigned is an (individual (partnership) (corporation) under the Laws of the State of

_____having principal offices at _____

BIDDER _____

SIGNATURE _____

NAME _____

TITLE _____

DATE _____

END OF SECTION 004343

SECTION 004343 - STATEMENT OF OWNERSHIP

This is to certify that in accordance with Chapter 33, Laws of 1977, the names and addresses of all stockholders in this corporation or partnership who own 10% or more of its stock, of any class, or of all individual partners in the partnership who own a 10% or greater interest therein, as the case may be, are listed below. If one or more such stockholder or partner is itself a corporation, or partnership, the stockholders holding 10% or more of that corporations, stock, or the individual partners owing 10% or greater interest in that partnership, as the case may be, are also listed.

NAME	ADDRESS
_____	_____
	_____
_____	_____
	_____
_____	_____
	_____
_____	_____
	_____
_____	_____
	_____
_____	_____
	_____

Authorized Person Printed Name: _____

Authorized Person Signature: _____

Representing: _____

Address: _____

_____

END OF SECTION 004353

SECTION 004363 - HOLD HARMLESS AGREEMENT

It is further agreed that the undersigned hereby agrees to defend, indemnify and hold harmless the Board of Trustees, its officers, employees, volunteers, and agents, from and against all claims, damages, losses and expenses including reasonable attorney's fees in case it shall be necessary to file an action, arising out of performance of the work herein, which is; 1) for personal or bodily injury, illness or death, or for property damage, including loss of se, and; 2) caused in whole or in part by

_____ (Name of contractor)

negligent act or omission or that a subcontractor or that of anyone employed by them or for whose acts contractor or subcontractor may be liable. This indemnification and agreement shall apply in all instances whether the Board of Trustees, its officers, employees, volunteers and / or agents, is/are made a party to the action or claim or is subsequently made a party to the action by third-party-inpleading or is made a part to a collateral action arising, in the whole or in part, from any of the issues emanating from the original cause of action or claim.

Full Name of Contractor:_____

Business Address:_____

_____

Zip Code: _____

Telephone Number: _____

Project Description: _____

_____

Authorized Person Printed Name: _____

Authorized Person Signature: _____

Witness Printed Name: _____

Witness Signature: _____

END OF SECTION 004363

SECTION 004373 - SITE VISIT VERIFICATION

In submitting this proposal, I verify that I and/or authorized representatives of my company have personally visited the site and acquainted myself with the conditions there existing and as noted in the specifications.

Sworn to and subscribed before me _____
(signature)

This _____ day of _____

Printed Name: _____

Company Name: _____

Address: _____

_____

Title: _____

END OF SECTION 004373

SECTION 004519 - AFFIDAVIT OF NON-COLLUSION

Name of Project: NEW PUBLIC SAFETY BUILDING
MAYS LANDING CAMPUS
Atlantic Cape Community College

I, _____ (Name) of the County of _____ (County)

and the State of_____(State), of full age, being duly sworn according to law, on my oath, depose and say that:

I am _____ (Official Position)

of the firm of _____ (Bidder's Name),

the bidder making the Proposal for the above named project, and that I executed the said Proposal with full authority to do so.

I, and to the best of my knowledge, the Bidder, and any officer, director, employee or other representative of the bidder, have not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free, competitive bidding in connection with the above named project.

All statements contained in said Bid and all Contract Documents and in this affidavit are true and correct, and made with full knowledge that the Board of Trustees of Atlantic Cape Community College relies upon the truth of the statements contained in said Bid and contract documents and in the statements contained in this affidavit in awarding the contract for the said project.

Sworn on behalf of:

_____
Name of Firm (Bidder)

_____
Signature of Official

Subscribed and sworn to me this

_____ day of _____,20____

_____ (name) (Seal)

Notary Public of: _____
(State)

END OF SECTION 004519

SECTION 004530 – STOCKHOLDER DISCLOSURE CERTIFICATION

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: _____

City, State, ZIP: _____

_____

Part I Check the appropriate box

☐ I certify that the list below contains the names and home addresses of all stockholders holding 10% or more of the issued and outstanding stock of the undersigned

OR

☐ I certify that no one stockholder owns 10% or more of the issued and outstanding stock of the undersigned.

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

☐ Sole Proprietorship

☐ Corporation

☐ Partnership

☐ Subchapter S Corporation

☐ Limited Liability Company (LLC)

☐ Limited Partnership

☐ Limited Liability Partnership (LLP)

☐ Other (be specific): _____

Sign and Notarize the form below, and, if necessary, complete the stockholder list below:

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

Subscribed and sworn before me this _____ day of _____
(day) (month, year)

(Notary Public)

My Commission Expires:

_____
(Affiant)

_____
(Print name and title of Affiant)

END SECTION 004530.

SECTION 004535 - NO MATERIAL CHANGE OF CIRCUMSTANCES AFFIDAVIT

I, _____ being of full age under oath depose and say:

1. I am a(n) owner, partner, shareholder or officer of the company set forth below and am duly authorized to execute this affidavit on its behalf.

2. A statement as to the financial ability, adequacy of plant and equipment, organization and prior experience of [Bidder], has been submitted to the Department of Treasury within one (1) year preceding the date of opening of bids for this contract.

3. I certify, that there has been no material adverse change in the qualification information of [Bidder] since such statement was submitted to the Department of Treasury except:

   _____

   _____.

SEAL

_____
TITLE

_____
COMPANY

Sworn to and subscribed
before me on this day
of , 201_.

_____
Notary Public

END OF SECTION 004535

SECTION 004536 – AFFIRMATIVE ACTION LANGUAGE: EXHIBIT B and AFFIRMATIVE ACTION ACKNOWLEDGMENT

EXHIBIT B: N.J.S.A. 10.5-31 et seq. (P.L. 1975, c127) N.J.A.C. 17:27-1.1 et seq.

MANDATORY EQUAL OPPORTUNITY LANGUAGE: CONSTRUCTION CONTRACTS

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

a. 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 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.

b. 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;

c. 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.

d. 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.

e. 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 Department 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 Department 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 Department 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.S.A. 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 Department of LWD, Construction EEO Monitoring Program, and minority and women referral organizations listed by the Division pursuant to **N.J.A.C. 17:27-5.3,** of its workforce needs, and request referral of minority and women workers;

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

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

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

(5) If it is necessary to lay off some of the workers in a given trade on the construction site, layoffs shall be conducted in compliance with the equal employment opportunity and non-discrimination standards set forth in this regulation, as well as the 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 Department 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 Department 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 Department 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 Department of LWD, Construction EEO Monitoring Program and submitted promptly to the Department 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 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 Department of LWD, Construction EEO Monitoring Program an initial project workforce report (Form AA 201) electronically provided to the public agency by the Division, through its website, for distribution to and completion by the contractor, in accordance with **N.J.A.C. 17:27-7.** The contractor also agrees to submit a copy of the Monthly

Project Workforce Report once a month thereafter for the duration of this contract to the Department 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 the 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 Department of LWD, Construction EEO Monitoring Program as may be requested by the Department 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 Department of LWD, Construction EEO Monitoring Program for conducting a compliance investigation pursuant to **Subchapter 10 of the Administrative Code at N.J.A.C. 17:27**.

_____	_____	_____
Authorized Signature	Name of Firm	Date

END SECTION 004536

State of New Jersey

DEPARTMENT OF THE TREASURY
DIVISION OF PUBLIC CONTRACTS
EQUAL EMPLOYMENT OPPORTUNITY COMPLIANCE
PO Box 209
TRENTON, NJ 08625-0209

JON S. CORZINE
Governor

R. DAVID ROUSSEAU
State Treasurer

NOTICE OF ADDITIONAL MANDATORY CONSTRUCTION CONTRACT LANGUAGE

On Friday, August 28, 2009, Governor Corzine signed Executive Order No. 151 which enhances inclusion efforts for minorities and women to benefit from the New Jersey Economic Assistance and Recovery Plan and the American Recovery and Reinvestment Act of 2009 (ARRA). The Executive Order includes a provision which requires all state agencies, independent authorities and colleges and universities to include additional mandatory equal employment and affirmative action language in its construction contracts. It is important to note that this language is in addition to and does not replace the mandatory contract language and good faith efforts requirements for construction contracts required by N.J.A.C. 17:27-3.6, 3.7 and 3.8, also known as Exhibit B. The additional mandatory equal employment and affirmative action language is as follows:

It is the policy of the **[Reporting Agency]** that its contracts should create a workforce that reflects the diversity of the State of New Jersey. Therefore, contractors engaged by the **[Reporting Agency]** to perform under a construction contract shall put forth a good faith effort to engage in recruitment and employment practices that further the goal of fostering equal opportunities to minorities and women.

The contractor must demonstrate to the **[Reporting Agency]**'s satisfaction that a good faith effort was made to ensure that minorities and women have been afforded equal opportunity to gain employment under the **[Reporting Agency]**'s contract with the contractor. Payment may be withheld from a contractor's contract for failure to comply with these provisions.

Evidence of a "good faith effort" includes, but is not limited to:

1. The Contractor shall recruit prospective employees through the State Job bank website, managed by the Department of Labor and Workforce Development, available online at http://NJ.gov/JobCentralNJ;
2. The Contractor shall keep specific records of its efforts, including records of all individuals interviewed and hired, including the specific numbers of minorities and women;

3. The Contractor shall actively solicit and shall provide the **[Reporting Agency]** with proof of solicitations for employment, including but not limited to advertisements in general circulation media, professional service publications and electronic media; and

4. The Contractor shall provide evidence of efforts described at 2 above to the **[Reporting Agency]** no less frequently than once every 12 months.

5. The Contractor shall comply with the requirements set forth at N.J.A.C. 17:27.

To ensure successful implementation of the Executive Order, state agencies, independent authorities and colleges and universities must forward an Initial Project Workforce Report (AA 201) for any projects funded with ARRA money to the Division of Public Contracts EEO Compliance immediately upon notification of award but prior to execution of the contract.

If you have questions or require additional information, please contact the Division at 609-292-5473.

"If awarded a contract, your company/firm shall be required to comply with the requirements of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27 et. seq."

2.3 Mandatory Contract Language

All contracts issued by a Public Agency must contain the mandatory affirmative action language set forth in N.J.A.C. 17:27 et seq. During a review, Division representatives will review the Public Agency's contracts to ensure compliance with this provision.

For all goods, general services and professional services vendors, Public Agency contracts must include the affirmative action language of Exhibit A (see Attachment 2).

For all construction contracts, Public Agency contracts must include the affirmative action language of Exhibit B (see Attachment 3). Additional mandatory language for State Agencies, Independent Authorities, Colleges and Universities is also required as a result of Executive Order 151 and P.L.2009, c.335 (see attachment 14).

2.4 Affirmative Action Evidence

All successful bidders for goods, general services and professional services contracts are required to submit evidence of appropriate affirmative action compliance to the Division and the awarding Public Agency. For construction contracts, evidence must be submitted to Dept. of LWD and the awarding Public Agency. During a review, Division representatives will review the Public Agency files to determine whether the affirmative action evidence has been submitted by the vendor or contractor. Specifically, each vendor or contractor shall submit to the Public Agency, prior to execution of the contract, one of the following documents:

Goods, General Services and Professional Services Vendors

1. Letter of Federal Approval indicating that the vendor is under an existing federally approved or sanctioned affirmative action program. A copy of the approval letter must be provided by the vendor to the Public Agency and the Division (see Attachment 4). This approval letter is valid for one year from the date of issuance. Or,

2. A Certificate of Employee Information Report (hereafter "Certificate"), issued in accordance with N.J.A.C. 17:27 et seq. The vendor must provide a copy of the Certificate to the Public Agency as evidence of its compliance with the regulations. The Certificate represents the review and approval of the vendor's Employee Information Report, Form AA-302 by the Division (see Attachment 5). Or,

(Note: The period of validity of the Certificate is indicated on its face. Certificates must be renewed prior to their expiration date in order to remain valid. The Certificate is valid for three years for any vendor with 50 or more employees or for seven years for any vendor with less than 50 employees. The Public Agency should review any Certificate submitted to ensure the date is still valid.)

3. The successful bidder shall complete an Initial Employee Report, Form AA-302 and submit it to the Division with a check or money order for $150.00 made payable to "Treasurer, State of NJ" and forward a copy of the Form to the Public Agency (see Attachment 6). Upon submission and review by the Division, the Report shall constitute evidence of compliance with the regulations.

SECTION 004540 – DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN

_____
Company Name

Pursuant to Public Law 2012, c. 25, any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract must complete the certification below to attest, under penalty of perjury, that the person or entity, or one of the person or entity's parents, subsidiaries, or affiliates, is not identified on a list created and maintained by the Department of the Treasury as a person or entity engaging in investment activities in Iran. If the Department of Treasury finds a person or entity to be in violation of the principles which are the subject of this law, the Department of Treasury shall take action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the person or entity.

I certify, pursuant to Public Law 2012, c. 25, that the person or entity listed below for which I am authorized to bid:

☐ is not providing goods or services of $20,000,000 or more in the energy sector of Iran, including a person or entity that provides oil or liquefied natural gas tankers, or products used to construct or maintain pipelines used to transport oil or liquefied natural gas, for the energy sector of Iran, AND

☐ is not a financial institution that extends $20,000,000 or more in credit to another person or entity, for 45 days or more, if that person or entity will use the credit to provide goods or services in the energy sector in Iran.

In the event that a person or entity is unable to make the above certification because it or one of its parents, subsidiaries, or affiliates has engaged in the above-referenced activities, a detailed, accurate and precise description of the activities must be provided below to Atlantic Cape Community College under penalty of perjury.

PLEASE PROVIDE FURTHER INFORMATION RELATED TO INVESTMENT ACTIVITIES IN IRAN

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

PROVIDE INFORMATION RELATIVE TO THE ABOVE QUESTIONS. PLEASE PROVIDE THOROUGH ANSWERS TO EACH QUESTION. IF YOU NEED TO MAKE ADDITIONAL ENTRIES, USE ADDITIONAL PAGES

Name:

Relationship to Bidder/Vendor:

Description of Activities:

Duration of Engagement:

Bidder/Vendor
Contact Name:

Contact Phone Number:

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

Full Name (Print):

Signature:

Title:

Date:

Bidder/Vendor:

END SECTION 004540

SECTION 004550 - CONTRACTOR'S EQUIPMENT CERTIFICATION

CERTIFICATION TO DEMONSTRATE THE CONTRACTOR'S ABILITY TO PERFORM THE WORK WITH THE NECESSARY EQUIPMENT REQUIRED

****

I am _____ (an Owner, a Partner, or an Officer of the Company or Corporation and indicate which) of the Firm

_____
(Name of the Firm)

_____.
(State the Address of the Firm)

CHOOSE ONE OF THE FOLLOWING

****

( ) A. I hereby certify on behalf of _____
(Name of the Firm)

that we are the actual Owner, Lessee or control all equipment necessary to perform the work of this Project.

( ) B. I hereby certify on behalf of _____
(Name of the Firm)

that we are not the actual Owner or Lessee of the equipment necessary to perform the work of this Project. The source from which the equipment will be obtained is as follows: (Provide Names, Addresses and Telephone Numbers)

_____

_____

_____

_____

NOTE: Should additional Names, Addresses and Telephone Numbers be required, please list them on a separate sheet and attach to this document.

Certificates from the Owner or Person in control of the equipment clearly granting our Firm the control of the equipment required for such time as may be required to perform the work of this Project are included and attached to this Certification.

_____
(Signature)

_____
(Typed Name and Title)

_____
(Date)

END OF SECTION 004550

SECTION 006111 – STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

The Contract to be used for this Project will be the *2017 Edition* of AIA Document A101 - STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR, with modifications set forth in Section 006150 – SUPPLEMENT TO THE FORM OF AGREEMENT included herein.

The *2017 Edition* of AIA Document A101 - STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR is included herein as reference. The actual agreement will include the provisions/modifications as noted in Section 006150 – SUPPLEMENT TO THE FORM OF AGREEMENT also included herein.

END OF SECTION 006111

AIA® Document A101™ – 2017

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

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

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

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

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

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

The Owner and Contractor agree as follows.

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

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

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

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

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

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

[ ] The date of this Agreement.

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

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

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

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

§ 3.3 Substantial Completion

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

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

[ ] By the following date:

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

Portion of Work	Substantial Completion Date

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

ARTICLE 4 CONTRACT SUM

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

§ 4.2 Alternates

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

Item	Price

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

Item	Price	Conditions for Acceptance

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

Item	Price

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

Item	Units and Limitations	Price per Unit ($0.00)

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

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

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

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

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

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

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

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

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

§ 5.2 Final Payment

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

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

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

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

§ 5.3 Interest

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

%

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

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

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

[ ] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[ ] Litigation in a court of competent jurisdiction

[ ] Other *(Specify)*

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

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

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

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

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

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

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

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

§ 8.5 Insurance and Bonds

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

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

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

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

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

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

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

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

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

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

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

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

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

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

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

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

SECTION 006112 – SUPPLEMENT TO THE FORM OF AGREEMENT

STANDARD AIA FORM

Work will be subject to provisions set forth by the American Institute of Architect's Standard AIA Document A101 "STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR", *2017 Edition*, Articles 1 thru 8 inclusive, which are hereby made a part of this Contract.

MODIFICATION OF AIA FORM A101

The following supplements modify, delete from, and/or add to AIA Form A101 “Standard Form of Agreement Between Owner and Contractor” as indicated by the following articles, paragraphs, etc. as noted below:

1. Following the title of the first page, delete the third paragraph in the right side margin “AIA Document A201-2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other General Conditions unless this document is modified.”
2. Articles, or portions thereof, that are not specifically modified, deleted, or superseded hereby, remain in full effect.
3. The Form of Agreement also may be supplemented elsewhere in the Contract Documents by provisions located in, but not necessarily limited to, the Project Manual.

ARTICLE 5 –PAYMENTS

5.1.8 Following the text: “Reduction or limitation of retainage, if any, shall be as follows:” insert “None.”

ARTICLE 8 – MISCELLANEOUS PROVISIONS

8.2 Delete the text of 8.2 and substitute the following: No Interest will be paid by the Owner for sums due and unpaid under the Contract.

8.6 Following the text: “Other Provisions:” insert “none”:

END OF SECTION 006112

SECTION 006113 - FORM OF PERFORMANCE AND PAYMENT BOND

KNOW ALL MEN BY THESE PRESENT: That

we/I _____
(Name of Contractor)

A _____
(Corporation, Partnership or Individual)

hereinafter called "Principal", and _____,
(Surety)

of _____ State of _____,

hereinafter called the "Surety", are held and firmly bound unto the ATLANTIC CAPE COMMUNITY COLLEGE, Mays Landing, Atlantic County, New Jersey, hereinafter called "Owner", in the penal sum of

_____Dollars
(Written Amount)

($ _____).
(Figures)

in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally to the Owner, firmly by these presents for the performance of the Construction Contract which is incorporated herein by reference and to pay for all labor, materials and equipment furnished for use in the performance of said Construction Contract.

THE CONDITION OF THIS OBLIGATION IS such that Whereas the Principal entered into a certain contract with the Owner, dated the _____ day of _____, 20_____, a copy of which is hereto attached and made a part hereof for the construction of all work under Contract covering work for:

NEW PUBLIC SAFETY BUILDING
AT THE
MAYS LANDING CAMPUS

FOR THE

ATLANTIC CAPE COMMUNITY COLLEGE
5100 BLACK HORSE PIKE
MAYS LANDING, NEW JERSEY, 08330

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties all the undertakings, covenants, terms, conditions and agreements of said Contract including the payment for labor, materials and equipment furnished for use in the performance of said contract. During the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that by accepting this obligation to ensure the faithful performance and proper fulfillment of the Contract, the Bonding Company agrees to assume all costs required to furnish additional manpower, materials, facilities, equipment, means and incidentals necessary, including night shifts, overtime operations, Sundays and holidays as may be necessary to insure the prosecution and completion of the work in accordance with phased substantial completion dates established in the Contract. The Bonding Company further agrees to reimburse and repay the Owner for all reasonable attorney's fees, additional consequential Architectural, Engineering fees incurred by the Owner for consequential losses or damages including, but not limited to, additional design work, submittal reviews, correspondence, job meetings, reviewing applications for payment, punch lists and similar services by reason of Contractor's default.

PROVIDED, FURTHER, that the Surety, for value received hereby stipulates and agrees that no change, extension of time, alterations or additions to the terms of the Contract or to the work to be performed thereunder or the Project Manual accompanying the same shall in any way affect its obligation on this Bond, and it does hereby waive notice of any change, extension of time, alterations or additions to the terms of the Contract or to the work or to the Project Manual.

PROVIDE FURTHER, that no final settlement between the Owner and Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20____.

ATTEST: _____
(Principal)

_____
(Principal) Secretary

(SEAL)

BY: _____ (S)

_____

_____
(Address-Zip Code)

_____
(Witness as to Principal)

_____

_____
(Address-Zip Code)

ATTEST: _____
(Surety)

BY:_____
(Attorney-in-fact)

_____

_____
(Address - Zip Code)

_____
(Surety) Secretary

(SEAL)

_____
(Witness as to Surety)

_____

_____
(Address-Zip Code)

NOTE: Date of Bond must be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

The rate of premium on this Bond is $ _____ per Thousand.

The total amount of premium charges is $ _____. (The above must be filled in by the Corporate Surety)

IMPORTANT NOTE

Surety Company executing Bond must be authorized to transact business in the State of New Jersey and rated as "A" or better as determined by A.M. Best Company.

END OF SECTION 006113

SECTION 006119 - FORM OF MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS, That we,

_____

as Principal and

_____

as Surety, are held and firmly bound unto the ATLANTIC CAPE COMMUNITY COLLEGE, as Owner, in the amount of ONE HUNDRED PERCENT (100%) OF THE CONTRACT SUM.

_____

($_____)
(100% of the Contract)

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.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that whereas, the Principal did on _____, _____, 20____, enter into a Contract for:

NEW PUBLIC SAFETY BUILDING
MAYS LANDING CAMPUS

FOR THE

ATLANTIC CAPE COMMUNITY COLLEGE
5100 BLACK HORSE PIKE
MAYS LANDING, NEW JERSEY, 08330

WHICH said Contract is made a part of this Bond as though set forth herein: NOW, if the said Principal shall remedy without cost to the Owner any defects which may develop during a period of Two (2) years from the date established in the Final Certificate of Substantial Completion for the work performed under the said Contract, provided such defects, in the judgment of the Owner are caused by defective or inferior materials or workmanship.

The said Surety hereby stipulates and agrees that no modification, deletions or additions in or to the terms of the said Contract or the Drawings or Project Manual therefore shall in any way affect its obligation on this Bond.

(continued on next page)

IN WITNESS WHEREOF, the said Principal and Surety have duly executed this bond under seal this

_____ day of _____, 20___.

ATTEST:

_____
(Principal)

_____
(Principal) Secretary

(SEAL)

BY: _____ (S)

_____

_____
(Address-Zip Code)

_____
(Witness as to Principal)

_____

_____
(Address-Zip Code)

ATTEST:

_____
(Surety)

BY:_____
(Attorney-in-fact)

_____

_____
(Address - Zip Code)

_____
(Surety) Secretary

(SEAL)

_____
(Witness as to Surety)

_____

_____
(Address-Zip Code)

END OF SECTION 006119

SECTION 006211 – GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The General Conditions for the Contract for Construction to be used for this Project will be the *2017 Edition* of AIA Document A201 – GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION included herein, together with modifications set forth in Section 007300– SUPPLEMENTARY CONDITIONS included herein.

END OF SECTION 006211

AIA® Document A201™ – 2017

General Conditions of the Contract for Construction

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

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

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

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

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

TABLE OF ARTICLES

Init.
/

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

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

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

§ 1.2 Correlation and Intent of the Contract Documents

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

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

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

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

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

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document

G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

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

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

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

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

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

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

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

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and

delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely

upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

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

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

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

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- **.1** assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- **.2** assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

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

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- **.1** The change in the Work;
- **.2** The amount of the adjustment, if any, in the Contract Sum; and
- **.3** The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- **.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- **.2** Unit prices stated in the Contract Documents or subsequently agreed upon;
- **.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- **.4** As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

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

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
.5 damage to the Owner or a Separate Contractor;
.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

.1 employees on the Work and other persons who may be affected thereby;
.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property
If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances
§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will

promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or

expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during

that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

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

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

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- **.1** that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- **.1** cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

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

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

SECTION 006230 – SUPPLEMENTARY CONDITIONS

STANDARD AIA FORM:

Work will be subject to provisions set forth by the American Institute of Architect's Standard AIA Document A201 "General Conditions of the Contract for Construction", *2017 Edition*, Articles 1 thru 15 inclusive, which are hereby made a part of this Specification.

MODIFICATION OF AIA FORM A201

Modify, supplement and/or add the following articles, paragraphs, etc. as noted below:

ARTICLE 1 – GENERAL PROVISIONS

1.1 BASIC DEFINITIONS add the following:

1.1.1 Delete the text of the paragraph and substitute the following:

The Contract Documents are enumerated in the agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for minor change in the Work issued by the Architect. The Contract Documents include the advertisement or invitation to bid, Instruction to bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposal or the Contractor’s bid or proposal and portions of Addenda relating to bidding or proposal requirements.

1.1.2.1 The Owner reserves the right to hire a Construction Manager for the project. In the event the Construction Manager is hired by the Owner, the Owner may substitute the CMA version of the AIA Documents A101 and A201 (2017), and the Contractor shall be bound thereby.

1.1.2.2 Assignment of the Work: Neither this Agreement nor any part thereof shall be assigned by a Contractor to any person, firm, or corporation, without prior written approval of the Owner to such assignment. This provision shall not preclude the Contractor from subletting parts of the work to Subcontractors in accordance with general practices of the trade.

1.1.6.1 THE PROJECT MANUAL

The Project Manual is a volume assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract, and Specifications.

1.1.8 The term “Architect” shall include the Architect, its consultants and subconsultants, and the owners, principals and employees of each of them.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS add the following:

1.2.1.2 In the event of any conflict among or within the Drawings, Specifications, or Schedules, the provisions specifying a better quality or greater quantity of work or materials or comply with more stringent requirements shall take precedence and shall be the provision used in estimating bids and performing the contract, unless otherwise directed in writing by the Architect. The Architect shall determine which of the conflicting items represents the work of better quality or greater quantity or more stringent requirements. Information not shown on the drawings but included in the specifications, and vice versa, is included and required in the base bid Contract and shall be furnished and installed by the Contractor at no additional cost.

1.2.1.3 During the course of the Work, should any ambiguities or discrepancies be found in the Drawings, Specifications, or Schedules to which the Contractor has failed to call attention before submitting his bid, then the Architect will interpret the intent of the Drawings, Specifications or Schedules and the Contractor hereby agrees to abide by the Architect’s interpretation and to carry out the work in accordance with the decision of the Architect.

ARTICLE 2 - OWNER

2.1 GENERAL add the following:

2.1.1 Delete the text of the paragraph and substitute the following:

The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have the following authority as delegated by the Owner. The term "Owner" means the Owner or the Owner’s authorized representative:

Owner is to mean ATLANTIC CAPE COMMUNITY COLLEGE.

Owner's authorized representative is to mean the ATLANTIC COUNTY IMPROVEMENT AUTHORITY.

2.1.1.1 The Owner’s Representative shall have the same access to the Work provided to the Architect. He shall be consulted by the Contractor’s Superintendent on all matters pertaining to the Work and shall transmit all instructions of the Architect regarding the Work to the Contractor’s Superintendent.

2.1.1.2 The Owner’s Representative may, in addition to inspection by others required elsewhere in the Contract Documents, inspect all Work under this Contract. While he will assist the Contractor’s Superintendent in obtaining additional information in explanation of the Contract Documents and will serve as liaison between the Contractor’s Superintendent and the Architect, he is not empowered to authorize deviations from the Contract nor to enter into the Contractor’s area of responsibility for supervision and construction means, methods, techniques, sequences, procedures or coordination or for safety of persons and

property. The fact that he may have permitted faulty Work or Work not in accordance with the Contract Documents to be performed shall not relieve the Contractor from any responsibility to perform fully in accordance with the Contract.

2.1.1.3 The Architect is to mean SPIEZLE ARCHITECTURAL GROUP, INC.

2.1.2 Delete the text of the paragraph and substitute the following:

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

2.1.2.1 **Prohibited Interests:** No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept, or approve, or to take part in negotiating, making, accepting, or approving any architectural, engineering, inspection, construction, or material supply contract or any subcontract in connection with the construction of the Project shall become directly or indirectly interested personally in this Contract or in any part thereof. No officer, employee, architect, attorney, engineer, or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory, or other similar functions in connection with the construction of the Project, shall be directly or indirectly interested personally in this Contract or in any part thereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the Project.

2.1.2.2 Owner's authorized representative is to mean SPIEZLE ARCHITECTURAL GROUP, INC.

2.2 EVIDENCE OF THE OWNER'S FINANCIAL ARRANGEMENTS

Delete Article 2.2 in its entirety.

2.3 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.3.3 Delete the text of paragraph 2.3.3 and substitute the following:

If the employment of the Architect terminates, the Owner shall employ a successor whose status under the Contract Documents shall be that of the Architect.

2.3.6 Delete the text of paragraph 2.3.6 and substitute the following:

Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor electronic documents for the purpose of making reproductions pursuant to Section 1.5.2

2.5 OWNER'S RIGHT TO CARRY OUT THE WORK delete the text of paragraph 2.5 and substitute the following:

2.5.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect . In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure included but not limited to reasonable attorney's fees. The Architect may, pursuant to section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the Change Order. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor and/or its surety shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

2.5.2 If, in the opinion of the Architect, work to be corrected by the Owner is judged to be critical or time critical, the Architect, will inform the Owner and Contractor of the crucial nature of the work. Upon notification, the seven day periods noted in Article 2.5.1 will each be reduced to three days.

2.6 INSPECTION, CONDEMNATION, AND REJECTION OF WORK AND MATERIALS (new section)

2.6.1 The Owner reserves the right to inspect all goods and services provided or performed on the Project and condemn any goods or services which in its sole judgment do not conform to the specifications of the contract therefore.

ARTICLE 3 - CONTRACTOR

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR add the following:

3.2.1 Delete the text of the paragraph and substitute the following:

Execution of the Contract by the Contractor is a representation that (1) the Contractor has visited the site, become familiar with local conditions under which the Work is to be performed, has submitted any discrepancy to the Architect prior thereto and correlated personal observations with requirements of the Contract Documents; (2) prior to the execution of the Agreement, the Contractor and each subcontractor evaluated and satisfied themselves as to the conditions and limitations under which the Work is to be performed, including without limitation, (i) the location, condition, layout, and nature of the Project site and surrounding areas, (ii) generally prevailing climatic conditions, (iii) anticipated labor supply and costs, (iv) availability and cost of materials, tools and equipment, and (v) other similar issues. The Owner assumes no responsibility or liability for the physical condition or safety of the Project site or any improvements located on the Project site. Except as set forth in Paragraph 10.3, the Contractor shall be solely responsible for providing a safe place for the performance of the work. The Owner shall not be required to make any adjustments in either the Contract Sum or the Contract Time

in connection with any failure by the Contractor or any subcontractor to have complied with the requirements of this subparagraph 3.2.1.

3.2.2 Delete the text of the paragraph and substitute the following:

Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. Dimensions given at full-size or large-scale details shall take precedence over smaller scaled measurements. These obligations are for the purpose of facilitating coordination and construction by the Contractor, as well as for discovering errors, omissions, and inconsistencies in the Contract Documents; as such, discrepancies shall be referred to the Architect in writing for adjustments before any work affected thereby has been performed.

3.2.2.1 Where compliance with two or more industry standards or sets of requirements is indicated within Contract Documents, and overlapping of those different standards or requirements establishes different or conflicting minimums or levels of quality, the most stringent requirement (which is generally recognized to be the most costly) is intended and will be enforced. Refer apparently-equal-but-different requirements, and uncertainties as to which level of quality is more stringent, to Architect/Engineer in writing for a decision before proceeding. These may be shown on any plan, partial plan, in the Project Manual or in any Addenda.

3.2.2.2 The general character of the detail work is indicated on drawings and in specifications. The term “similar” shall be used on the drawings in its general sense and not as meaning identical, and all details shall be worked out in relation to their location and their connection to other parts of the work. Where on any drawings a portion of the work is drawn out and the remainder is indicated in outline, the parts drawn out shall apply also to other like portions of the work. When a detail is indicated by starting only, such detail shall be continued throughout the courses or parts in which it occurs and shall also apply to all other similar parts in the work unless otherwise indicated. In case of differences between small and large scale drawings, the larger scale drawings shall take precedence. Any discrepancies shall be referred to the Architect for adjustment before any work affected thereby has been performed.

3.2.2.3 Since the Contractor, as Bidder, was afforded the opportunity to visit the Project Site, Contractor shall be held responsible for cognizance and knowledge of existing features and conditions ascertainable by such site visit, and costs of the Work associated therewith.

3.2.2.4 The Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. If any errors, inconsistencies or omissions appear in the Drawings, Specifications, or other Contract Documents, which should reasonably have been discovered and concerning which interpretation had not been

obtained during the Bidding or Proposal Period, the Contractor shall within ten (10) days after receiving written "Notice to Proceed" notify the Architect in writing of such error, inconsistency or omission. In the event the Contractor fails to give such notice, he will be responsible for the results of any such errors, inconsistencies or omissions and the cost of rectifying same. At the end of the ten (10) day period, Interpretations of this procedure shall be made by the Architect and its decision will be final.

3.2.4 Delete the text of the paragraph and substitute the following:

If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, including a failure to recognize or should have reasonably recognized any error, inconsistency, omission or difference in the Contract Documents, then the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities. U The Contractor shall be liable to the Owner and/or Architect for any and all damage resulting from any error, inconsistency, omission or difference which he knew or reasonably should have known but failed to report to the Architect. If the Contractor performs any work when he knows or should have known that it involves any error, inconsistency, omission or difference, without notice to the Architect and the Owner, the Contractor shall assume full responsibility for such work and shall bear an appropriate amount of the attributable costs for correction.

3.2.5 The Contractor shall forward to the Architect a written request for supplementary drawings and data needed by him to carry on his work. Such request shall be timed so as to enable the Architect to properly act well in advance of need at the site.

3.2.6 If the Architect must prepare "responses to Contractor's Requests for Information" (RFI's) where such information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or Project correspondence or documentation the Owner will back-charge the Contractor for all costs associated with the additional Contract Administration Services provided by the Architect.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES add the following:

3.3.1.1 At the preconstruction meeting, Contractors shall identify those individuals who shall supervise and direct the Work including both office and field supervisors. The on-site supervisor shall be present at all times that the Contractor's forces are present to perform work, shall attend all progress meetings, shall attend all coordination and scheduling meetings and such other meetings as may be reasonably requested and scheduled by the Architect. Upon the Architect's request, where there is a concern as to the progress of

quality of the Contractor's work, the Contractor shall cause the President or other similarly authorized representative of the Contractor with the power to make decisions of financial consequence to the Contractor, to attend meetings scheduled by the Architect.

3.3.1.2 The attendance at all meetings set forth above by a qualified representative of the Contractor is mandatory. Any Contractor who is not represented at these meetings without previously being excused by the Architect, or who is not present at the appointed starting time of the meeting, will be assessed a late fee in the amount of $250.00 per occurrence. The amount of this fee will be deducted from the Contractor's account through the issuance of a Change Order.

3.3.2.1 All personnel or agents of the Contractor shall observe all rules and regulations in effect at the Owner's premises. Employees, agents and Subcontractors of the Contractor, while on the Owner's property, shall be subject to the control of the Owner, but under no circumstances shall such persons be deemed to be employees or agents of the Owner. The Contractor's personnel are required on a daily basis to report and sign in, at a location to be determined by the Owner, each time they report for service and sign out when leaving the premises. Nothing herein shall limit the Contractor's duty to provide onsite safety and to secure the site.

3.3.2.2 Contractor's personnel and agents are not to engage in any activities with the building occupants, owner's personnel or agents of the Owner unless duly authorized to do so in a prior writing by the Owner's authorized representative. All contractor's personnel and agents are required to wear identification badges identifying the individual and the firm for which they are employed. The Contractor shall assume full responsibility for the actions of all personnel and agents in its employ. The Contractor shall maintain proper supervision of the work in progress at all times.

3.3.2.3 Contractor is required to provide background checks with fingerprinting performed within the last six (6) months on all personnel who will be working on site on the project, for Owners review and acceptance. The Contractor is responsible to pay all costs associated with this process. Background and Fingerprint checks can be provided through Sagem Morpho, Inc. (877) 503-5981, or other agency acceptable to the Owner. The Contractor shall not assign any employee to work at this project site who has a record or conviction for any offenses of the first or second degree.

3.3.2.4 All personnel and agents used by the Contractor for the performance of its work shall be properly trained and qualified for the type of work being performed and shall have the minimum ability and experience for its classification. The Owner reserves the right to reasonably refuse to accept services from any personnel. The Contractor shall provide evidence of qualifications for any personnel performing work under its contract upon request.

3.3.2.5 The Owner (and/or the Owner's Representatives) reserves the right to direct the removal from the site of any person, equipment and or entity which displays inappropriate behavior, including but not limited to, smoking, alcohol consumption, drugs, fighting, intimidating behavior, vandalism, theft, improper storage, improper or illegal acts, unfit persons etc.

3.3.2.6 Owner has the sole right to modify any and all security requirements at the Project Site.

3.3.4 The Contractor shall locate benchmarks and establish primary lines, level and plumb. The Contractor shall be responsible for layout, and elevations specifically relating to its work. It will verify all dimensions, elevations, levels, and plumb shown on the Drawings, and report any discrepancies or inconsistencies in the above in writing to the Architect before commencing work. The Contractor shall carefully protect benchmarks, from displacement or removal.

3.4 LABOR AND MATERIALS add the following:

3.4.4 Insofar as practical or required to obtain a full warranty, except as otherwise specified or shown, the material or product of one Manufacturer shall be used throughout the work for each specified purpose.

3.4.5 All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in strict accordance with the Manufacturer's directions. Should such directions conflict with the Specifications, the Contractor shall request (in writing) clarification from the Architect before proceeding.

3.4.6 All workmanship, equipment, materials, and articles incorporated in the work are to be of the best grade of their respective kinds for the purpose. Where equipment, materials or articles are referred to in the Specification as "equal to" any particular standard, the Architect shall decide the question of equality. Contractor shall immediately furnish to the Architect for its approval the name of the Manufacturer of material, machinery, mechanical and other equipment which he contemplates installing, together with their respective performance capacities and other pertinent information to avoid delays. When required, Contractor shall furnish, for the Architect's approval, full information concerning materials, or articles which he contemplates incorporating in the work. Samples of materials shall be submitted for approval when and as directed. Material, machinery, equipment, and articles installed or used without such written approval shall be at the risk of subsequent rejection.

3.4.7 No previous inspection or certificate of payment shall be held as an acceptance of defective work or materials or to relieve Contractor from the obligation to furnish sound materials and to perform good satisfactory work. The Architect shall be the sole judge of the materials and work furnished.

3.4.8 If the Architect deems it inexpedient to correct defective work not otherwise performed or completed in strict accordance with the Contract Documents, the difference in value between such work and that of the work, materials and conditions as specified, together with a fair allowance for damage shall be deducted from the Contract price.

3.4.9 Materials and equipment stored on the site shall not be placed directly on the ground and shall be completely covered and suitably protected to the Architect’s and Owner’s satisfaction.

3.4.10 Only manufactured products of the United States, wherever available, shall be used on the Project.

3.4.11 No later than seven (7) days from the date of this Agreement, the Contractor shall provide a list showing the name(s) of the manufacturer(s) proposed to be used for the Project. The Architect will promptly reply in writing to the Contractor stating whether the Owner or the Architect, after due investigation, has reasonable objection to any such proposal. If adequate data on any proposed manufacturer is not available, the Architect may state that action will be deferred until the Contractor provides further data. The Owner's or Architect's failure to reply within fourteen (14) days shall constitute acceptance of the proposal. Failure to object to a manufacturer shall not constitute a waiver of any of the requirements of the Contract Documents, and all products furnished by the listed manufacturer must conform to such requirements.

3.4.12 Any request by the Contractor which is made after the completion of bidding, to substitute any labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, or other facilities or services which is contrary to the provisions of the Drawings, Specifications, or Schedules, shall be reviewed and approved or rejected by the Architect. The Contractor shall be solely responsible for any delay caused by the request, and for the costs and expenses of the Architect's review of the request. The Architect shall be entitled to reject the request for any reason, including the Architect's or the Owner's subjective determination of the relative quality, compatibility or desirability of the substitution.

3.5 WARRANTY Delete the text of the paragraphs 3.5.1 and 3.5.2 and substitute the following:

3.5.1 In addition to the warranties set forth in the Contract Documents, the Contractor warrants that:

3.5.2 All materials and equipment furnished under this contract shall be of good quality and new unless otherwise authorized by the Owner. Any applicable manufacturer's warranties shall be transferred to the Owner.

3.5.3 Title to all work, materials, and equipment will pass to the Owner free and clear of all liens, claims, security interests, or encumbrances.

3.5.4 The Work will be free from defects not inherent in the quality of the Work in the Contract Documents required or permitted, and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. A **two (2) year** warranty of the materials, equipment, and work shall commence from the date established by the Owner as of the date of substantial completion for the entire project. This will apply to all materials and equipment (including but not limited to HVAC equipment) that the Owner may begin to use prior to the established date of substantial completion.

3.5.5 During the **twenty-third** month after the date of substantial completion of the work, the Owner, Architect, and the Contractor shall review the work to confirm the requirements

of the Contract have been satisfied. Any corrective work necessary will be addressed at that time, prior to expiration of the warranty. The requirement will not modify any of the Contractor's obligations relative to warranties that are in effect for a period greater than one year.

3.5.6 If within the warranty period, any portion of the materials, equipment, and work is found to be defective or not in accordance with the contract documents, the Contractor shall correct the problem at his own cost and expense. The payment of the contract sum shall not constitute an acceptance of the work not performed in conformance with the contract documents.

3.5.7 Any applicable warranties shall be transferred to the Owner by the Contractor at no additional cost or expense to the Owner.

3.6 TAXES renumber first paragraph to 3.6.1 and add the following:

3.6.2 The Owner is exempt under the provisions of the New Jersey Sales and Use Tax Act. Bidders are expected to comply with the provisions of the Act and rules and regulations promulgated pursuant thereto to qualify for exemptions with reference to any and all labor, service and materials supplied to or furnished in connection with the work to be performed. New Jersey State Sales and Use Tax on labor, service and materials provided by the Contractor, its Subcontractors, and suppliers used in this Project shall not be included in its Bid.

3.7 PERMITS, FEES, NOTICES, AND COMPLIANCE WITH LAWS add the following:

3.7.1.1 Contractor shall secure and pay for those items and it shall be included in his base bid.

3.7.1.2 The General Contractor will be responsible to take out and pay for any Bonds and insurance certificates required by the local Building Official, the County, the Municipality and all governmental authorities with jurisdiction over this project. Each Prime Contractor shall be responsible for filling out permits for its work under contract.

3.7.1.3 The code reviews and costs associated with code reviews have been paid or will be paid by the Owner to the New Jersey Department of Community Affairs or to the Local Code Official. Approved sets will be provided to the Contractor to file with the Local Officials and fill out permit information. Permits will be issued based upon the previously reviewed and approved drawings.

3.7.3.1 The Contractor is responsible for the scheduling and coordination of any inspections covered by local Code enforcement officials or agencies. The Architect is to be notified of all scheduled inspections when they are ordered. The Contractor must further ensure that the work to be inspected is properly completed and ready for inspection and that all equipment necessary to conduct the inspection (i.e. gauges, meters, etc.) is in place and in proper working order.

3.7.3.2 The Contractor shall be solely responsible for the coordination and scheduling of the Utility Company. The Contractor must plan to allow a minimum of 60 days notice when the Utility Company is to furnish new poles or equipment. In the event the Owner is

required to enter into a formal agreement with the Utility Company, the Contractor agrees to be bound by the terms thereof and to assume full responsibility for all requirements and obligations imposed upon the Owner by the Utility Company, including but not limited to any indemnification provisions.

3.7.4 Concealed or Unknown Conditions: renumber the first paragraph to 3.7.4.1 and add the following

In condition (1) add the words “elevational, dimensional,” before the words at the beginning of the sentence.

3.7.4.2 No adjustment in Contract Time or Contract Sum shall be permitted, however, in connection with a concealed or unknown condition that does not differ materially from those conditions disclosed or that reasonably should have been disclosed by the Contractor’s (i) prior inspections, tests, reviews, and pre-construction services for the Project, or (ii) inspections, tests, reviews, and pre-construction services that the Contractor had the opportunity to make or should have performed in connection with the Project.

3.9 SUPERINTENDENT add the following:

3.9.1.1 The superintendent shall have a minimum of 15 years of experience in construction. The Contractor’s superintendent shall perform only supervisory work and shall not be an active tradesman or be assigned to do manual work on the Project. Communications which the Contractor intends to rely upon shall be confirmed in writing.

3.9.1.2 When the project involves multiple project sites the Contractor is to assign a separate superintendent to each site who will be responsible for that particular site only.

3.9.1.3 The number of necessary assistants to the superintendent shall be such that work in progress shall be adequately supervised by each Contractor’s superintendent or one of his assistants. If, in the Architect’s opinion, the quality or progress of work is adversely affected by lack of adequate supervision, the Contractor shall increase the number of supervisory personnel at no increase to the Contract sum.

3.9.2. Delete the text of the paragraph and substitute the following:

The Contractor, as soon as practicable after award of the Contract, shall submit the name and qualifications of the Superintendent to the Owner for its approval. The Owner may conduct an interview of the Superintendent. Once approved, the Superintendent shall not be changed without the prior written approval of the Owner.

3.9.3 Delete the text of the paragraph and substitute the following:

The Superintendent shall not be removed from the work until all corrective and punch list items are completed to the Owner’s satisfaction.

3.10 CONTRACTOR'S CONSTRUCTION AND SUBMITTAL SCHEDULES add the following:

3.10.1.1 Contractor shall, within fourteen (14) calendar days after issuance of a Notice of Award, submit a draft Construction Schedule detailing logic, tasks and durations along with a detailed submittal schedule to the Architect and Owner, for the Architect's and Owner's information prepared in accordance with Section 013200 Construction Progress Documentation or approved equal along with a coordinated, detailed submittal schedule in accordance with Article 3.12.12, for work of the entire Project.

3.10.1.2 Seven (7) calendar days after the Architect and Owner receive the Contractor's coordinated, detailed draft Construction Schedule, the President of the Company or Corporation shall meet to review, and sign off on the coordinated detailed Contractor's Construction Schedule in the presence of the Architect and Owner's designee. Failure of the Contractor to sign off on the Contractor's Construction Schedule shall result in the assessment of liquidated damages as outlined in article 8.4. The schedule shall not exceed time limits current under the Contract Documents for substantial completion of any phases and that of the entire Project. The Contractor's Construction Schedule shall be updated by the Contractor to reflect the status of its work in relation to the Contractor's Construction Schedule, and any recommended changes in the sequencing and scheduling. The Contractor's Construction Schedule shall be updated at least every 30 calendar days or updated as often as deemed necessary by the Architect. Upon 4 working days of such request by the Architect, the Contractor shall submit a revised draft Construction Schedule update to the Architect. The updated Contractor's Construction Schedule will be reviewed at each Job Meeting and the Contractor is required to have a representative present at the Job Meeting with written authorization from the President of the Company or Corporation to review, agree upon, and sign-off on any approved and agreed upon changes to the updated Contractor's Construction Schedule. Failure by Contractor to correct the scheduled update in the time required shall result in a reduction in the Contractor's Contract Amount of FIVE HUNDRED ($500.00) per each occurrence as liquidated damages. In addition, payment to the Contractor may result in the withholding of payments to the Contractor, and in the liability of the Contractor for liquidated damages for the failure of the Project to be completed within the designated time. Any acceleration of the Contractor's Construction Schedule shall be agreed upon and approved by the Architect and Owner's designee.

3.10.1.3 Reference to procedures concerning Submittals shall be construed to incorporate all submittals including Contractor's Submittal Schedule of all products (to be received by the Architect within the time designated form the Notice to Proceed as indicated in article 3.10.1), Submittal Matrix (for substitute products and materials and included in Section 009000 Project Forms), Manufacturer's published literature, shop drawings, samples, design and other data. Each submittal is required to be accompanied by a fully completed submittal cover sheet, Section 009000 – Project Forms, Form 009310 – Submittal Cover Sheet, included in the Project Manual, or alternate form that includes the equivalent information approved by the Owner and Architect.

3.10.1.4 Submittal Schedules shall be prepared and incorporated into the Contractor's Construction Schedule as indicated in Section 013300 – Submittal Procedures. Contractor shall include the following considerations when preparing the submittal schedule so that approved products are at the project site ready for installation in accordance with the time established in the Contractors' Construction Schedule to avoid delays.

3.10.1.5 In the absence of a signed change order approving an extension of time, the Contractor Construction Schedule updates must show substantial completion date consistent with the date required in paragraph 8.1.5 of these Supplementary Conditions. Changes in logistics or duration shall not be made, except for good cause, and shall not result in an extension of the time for substantial completion. In the event certain aspects of the work fall behind the Contractor's Construction Schedule, the Contractor shall develop a recovery plan to revise logistics, add manpower resources to reduce durations, expedite procurement or advance start of activities, to get the project back on a schedule that will assure completion in accordance with the substantial completion date, which shall be agreed upon and approved by the Architect and Owner's designee.

3.10.1.6 When the schedule is complete and in compliance with 3.10.1.2, the schedule will become part of the construction documents, and shall be altered only in accordance with duly authorized change orders for extension of time in accordance with Article 8.3.

3.10.1.7 All work that may, as determined by the owner and/or Architect, be disruptive or interfere with sanitary conditions, plumbing, mechanical, electrical or the safety or activities of the building's occupants and/or may include noisy work, shall be performed after business hours, on weekends, and/or holidays so as not to interfere with scheduled activities and public safety, at no additional cost to the owner. In the event the Contractor does not meet the substantial completion date, the Contractor shall be responsible for fully cleaning all areas utilized by the owner's operations and where work is being performed at the end of each Contractors work session, to the owner's satisfaction so the area can be used for scheduled activities the following day. In the event the areas are not cleaned to the owner's satisfaction, the owner will clean the said areas as deemed necessary prior to the next regularly scheduled opening of operations for the next business day and deduct all associated costs of cleaning from the contract amount.

3.10.2.1 The Contractor shall deliver written evidence to the Architect that materials and equipment necessary for the timely installation and completion of the Work will be available, provided that failure to deliver such written evidence shall not excuse Contractor's obligation to timely furnish and install materials and equipment and to complete the Work.

3.10.3 Delete this paragraph and replace with the following:

The Contractor shall cooperate with the Owner in providing schedules updates and notification notices which may impact the Owner's operations. The Contractor will coordinate with the Owner to provide school bus companies, trash hauling companies, and others with the proposed construction schedules, anticipated detours and duration.

3.10.4 The Contractor shall work his forces overtime, at his expense, if required to maintain the Progress Schedule established.

3.10.5 The Contractor shall make proper assignments of employees in order to preclude labor, jurisdiction or like dispute, and if such disputes arise, do all things necessary to effect a prompt settlement thereof, including reference of such disputes to labor representatives or other established construction industry agencies for resolution, and be bound by their decisions.

3.10.6 The Contractor shall, within 24 hours after rejection of Work pursuant to Subparagraph 4.2.6 of the General Conditions, remove all materials and equipment so rejected and immediately replace said Work, at his cost, to the satisfaction of the Architect. Should the Work of the Owner or other contractors be damaged by such removal or replacement, the Contractor shall reimburse the Owner and other contractors and subcontractors for all costs incurred by them for correcting said damage.

3.10.7 The Contractor shall perform the work in accordance with the most recent schedule submitted to the Architect. In the event the Contractor fails to perform work in accordance with the schedule, at the Architect's request, the Contractor shall provide a recovery schedule, reflecting the Contractor's commitment to complete the work in accordance with the contract documents, including but not limited to double shifts, overtime, evening, and weekend work; at the Contractor's expense. Nothing contained herein shall be construed so as to prevent the Owner from resorting to its contractual remedies, including but not limited to liquidated damages, withholding of certification of payment, and termination due to Contractor's failure to perform work in accordance with the schedule.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES add the following:

3.12.1.1 Should Contractor wish to substitute a specified item, Contractor will submit a complete Submittal Matrix For Substitution Evaluation as Approved Equal form as provided in Section 009000 – PROJECT FORMS prior to the Architect/Engineer's consideration of a substitution.

3.12.4.1 Architect's review is for general conformance with the Design Concept and Contract Documents. Markings or comments shall not be construed as relieving the Contractor from compliance with all requirements of the Project Manual, Drawings, and Addenda. No departures there from, are to be considered as authorizing extra work or relieving the Contractor of work required within the contract. The Contractor remains responsible for materials, dimensions, details and accuracy for confirming and correlating all quantities and dimensions, and warranty/guarantee requirements and other conditions of the contract, etc. for selecting fabrication process and techniques of assembly, for performing this work in a safe and satisfactory manner, and of coordinating this work with that of all other trades.

3.12.5 Delete this paragraph and replace with the following:

The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents or otherwise required by the Owner or Architect in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect without action. The following submittal scheduled will be mandatory; time is from the date of the

notice to proceed in consecutive calendar days: All contracts and trades - thirty (30) days.

3.12.7.1 Submittals that require coordination with other products, installation of other products, or owner operations, etc. shall be submitted together as a coordinated package or they will not be reviewed by the Architect. Coordination of all items is the responsibility of the Contractor. Contractor will replace non-compatible components to the Architect's satisfaction at no additional cost.

3.12.8.1 Work performed contrary to the procedures set forth in this Article 3.12 shall be at the risk and expense of the Contractor. All shop drawings used for fabrication and erection shall be those reviewed by the Architect, without change. If change is found to be necessary on any reviewed shop drawing, product data or sample, it shall be resubmitted for further review.

3.12.10 & 3.12.10.1 &3.12.10.2 Delete these paragraphs and replace with the following:

3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall bear full responsibility for any and all costs incurred by the Owner, including architectural fees and reasonable attorneys' fees in connection with any and all deviations to the Contractor's submittals which were not approved by the Architect.

3.12.11 Submittals shall indicate materials, dimensions, seismic bracing in accordance with IBC International Building Code 2015, New Jersey Edition for Architectural, Mechanical and Electrical Component Seismic Design Requirements, and job conditions, including clearances required in relationship with the work of their trades. Contractor shall be responsible for verification of existing conditions and coordinating with the work of other

trades. Drawings shall be of sufficient size and drawn to sufficient scale to clearly show all details.

3.12.12 Submittals shall indicate compliance with seismic design requirements in accordance with IBC International Building Code 2015, New Jersey Edition for Architectural, Mechanical and Electrical Component Seismic Design Requirements. Provide seismic calculations signed and sealed by a Professional Engineer licensed in the state where the Project is located as required.

3.12.13 Submittals of Shop Drawings and other data, where possible, shall be submitted electronically in PDF Format.

3.12.14 Material Safety Data Sheets (MSDS): Submit Material Safety Data Sheets directly to the Owner; do not submit to the Architect/Engineer unless otherwise indicated. Architect/Engineer will not review submittals that include MSDS and will return entire submittal for resubmission.

3.12.15 American goods and products are to be used where possible.

3.12.16 Submittals shall contain a Contractor's stamp of approval, signed and dated by the submitting Contractor, prior to submission to the Architect. Such stamp of approval by the Contractor shall be confirmation that he has determined and verified materials, field measurements, and field construction criteria related thereto, and has checked and coordinated the information contained within such submittals. The Contractor shall also note in writing to the Architect, all deviations to the Contract Documents. Submittals will not be reviewed by the Architect/Engineer unless they contain such a stamp containing the words "Reviewed and Approved" accompanied by the Contractor's signature and date.

3.12.17 When brand, make, quality, etc., is not specified definitely, Contractor shall submit written documentation to the Architect for the particular kind of brand which he desires to use, altering or substituting others if not satisfactory.

3.12.18 If a substitution submittal differs from the design intent of the Contract documents, and all associated modifications to the design intent are not identified and included with the submission, all consequential additional costs associated with the substitution including, but not limited to, modifications to existing and new construction, building structure, plumbing, HVAC, electrical systems and all other modifications to not yet constructed work shall be borne by the contractor responsible for the submittal.

3.12.19 Consequential Substitution Impact Fees: If the Contractor makes, or causes to be made, due to impact from approval of substitutions of other than specified equipment and components, any substantial change in the form, type, system, and details of construction from those indicated in the Contract Documents, the Contractor shall be responsible for payment of all impact costs arising from such changes. Impact costs include, but are not limited to, any additional costs to the Owner inclusive of Architectural, Engineering, and Attorney fees, Code Review and Permit fees as well as all documented impact costs borne by other Contractors resulting from such substitutions. Impact cost shall also

include associated re-design, demolition and re-construction work, additional new construction work as may be required, and compliance with and maintenance of existing warranties, etc.

3.13 USE OF SITE add the following:

3.13.1 Add 3.13.1 prior to first paragraph.

3.13.2 Contractors shall use the site in a manner that will cause minimum interference and maximum safety to the occupants of the building and the general public. Contractor must have prior approval of the Architect and Owner for locations of stored materials, access, trailer locations, etc.

3.13.3 In addition to site utilization limitations and requirements shown on Drawings and indicated by the Contract Documents, the Contractor shall administer allocation of available space within Construction area so as to produce best overall efficiency in performance of total work of Project. The Contractor shall schedule deliveries so as to minimize time and space requirements for storage of materials and equipment on site.

3.13.4 Contractors may seek approval from the Owner to work weekdays, evenings, nights, weekends, and may be subject to reimburse/pay for all costs, i.e., custodial fees/OT, etc. Refer to the summary section 011000 for additional work restrictions. It is the Contractor's responsibility to ensure that his work is performed at times permitted by local ordinances and within such noise levels as may be mandated by the Township. The Contractor shall assume full responsibility for any violations committed in whole or in part by the Contractor or its subcontractors which may be charged to or assessed against the Owner and shall indemnify and hold harmless the Owner for any and all fines, costs and expenses of any kind, including reasonable attorney's fees, which may be charged to, assessed against, or incurred by the Owner in connection with such violations.

3.15 CLEANING UP add the following:

3.15.1.1 The Contractor shall maintain the Project construction area, streets, sidewalks and adjacent property clean, free of debris, dirt, unusable materials, garbage, etc. at all times until the Project is accepted by the Owner. The Contractor shall clean and provide maintenance on completed construction included in their scope of work, after installation, and as frequently as necessary through the remainder of the construction period. The Contractor shall be held responsible for removal of all their debris and excess material from the work area to dumpsters furnished by the Contractor.

3.15.1.2 The Contractor shall supervise its construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.15.2 Delete this paragraph and replace with the following:

The Contractor will be given 24 hours' notice to clean up as directed by the Architect and required by the contract, and if he does not comply, the Architect will arrange for other means to achieve the daily clean up and the Contractor will be back charged.

3.18 INDEMNIFICATION add the following:

3.18.1 Delete this paragraph and replace with the following:

To the fullest extent permitted by law the Contractor shall defend and indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting directly or indirectly from performance of the Work, including but not limited to:

(1) the acts or omissions of the Contractor, its agents, servants, officers, employees, subcontractors, subconsultants or any other person working at the Contractor's request, subject to its direction, or on its behalf;

(2) the loss of life or property, or injury or damage to the person, body or property of any person or persons whatsoever, that arises or results directly or indirectly from performance of the work or delivery of deliverables by the Contractor, its agents, servants, officers, employees, subcontractors, subconsultants, or any other person acting at the Contractor's request, subject to its direction, or on its behalf;

(3) any negligence, default, breach, or errors or omissions of the Contractor, its agents, servants, officers, employees, subcontractors, subconsultants, or any other person acting at the Contractor's request, subject to its direction, or on its behalf;

(4) violation or non-compliance with federal, state, local, municipal laws and regulations, ordinances, building codes (including without limitation the Americans with Disabilities Act, OSHA, Environmental Protection Act) arising from the performance or non-performance of; or arising out of conditions created or caused to be created by, the Contractor, its agent, servants, officers, employees, subcontractors, subconsultants, or any other person acting at the Contractor's request, subject to its direction, or on its behalf; and

(5) the use of copyrighted or uncopyrighted composition, secret process, patented or unpatented invention, article or appliance furnished or used in the performance of the work;

provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), or willful acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, including whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 3.18.

3.18.2.1 The Contractor's defense and indemnification obligation is not limited by, but is in addition to the insurance obligations contained in the contractual documents.

3.18.3 The Contractor agrees that any approval by the Owner of the work performed, and/or reports, plans, or specifications provided by the Contractor shall not operate to limit the obligations of the Contractor under the Contract Documents; and that the Owner assumes no obligations to indemnify or save harmless the Contractor, its agents, servants, officers, employees, subcontractors, subconsultant, against all claims that may arise out of its performance or nonperformance under the Contract Documents; and that the provisions of this defense and indemnification clause shall in no way limit the Contractor's obligations under the Contract Documents, nor shall they be construed to relieve the Contractor from any liability, nor preclude the Owner from taking any other actions available to it under any other provisions of the Contract Documents or otherwise at law or equity.

3.18.4 The provision of this section shall survive the termination of the Contract Documents.

ARTICLE 4 – ARCHITECT

4.2 ADMINISTRATION OF THE CONTRACT Add the following:

4.2.4.1 Any correspondence received after 4:00 PM prevailing time (the end of the business day) will be recognized as being received on the beginning of the next business day, Saturdays, Sundays, or holidays excepted and correspondence received on Saturdays, Sundays, and holidays will be recognized as received on the beginning of the next business day.

4.2.7.1 Whenever a material, article or piece of equipment is identified on the Plans or in the Specifications by reference to Manufacturers' or Vendors' names, trade names, catalogue numbers, etc., it is intended merely to establish a standard, and any material article, or equipment of other manufacturers and vendors which will perform adequately equal to or better than, the duties imposed by the general design, will be considered equally acceptable provided the material, article, or equipment so proposed is, in the opinion of the Architect of equal or better substance and function. The material, article or equipment so proposed shall not be purchased or installed by the Contractor without the Architect's written approval.

4.2.7.2 The acceptance of any material or method shall be understood as an acceptance only insofar as conforming to Specification requirements, and not as an absolute acceptance without respect to the requirements of the Specifications.

4.2.7.3 The typical time frame is three weeks for the Architect to review, and four weeks for the Architect and Engineer to review when an Engineer is also involved in the review.

4.2.10 Delete this paragraph and replace with the following:

If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in the Agreement between the Owner and Architect.

4.2.11 Delete this paragraph and replace with the following:

The Architect will interpret and decide matters concerning performance under and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limit agreed upon or otherwise with reasonable promptness, but in no event more than fifteen (15) days after receipt of the request by the Architect.

4.2.14.1 All requests for information shall be submitted by the Contractor, in the Architect's discretion, on the Request for Information form provided by the Architect The Contractor shall clearly and concisely set forth the issue for which the clarification or interpretation is sought and why a response is needed from the Architect. In the Request for Interpretation, the contractor shall set forth an interpretation or understanding of the requirement along with reasons why such an understanding was reached.

4.2.14.2 The Contractor shall bear all costs associated with the Request for Information including but not limited to architectural fees where such information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor prepared coordination drawings, or prior Project correspondence or documentation.

4.2.14.3 The Architect will review all Requests for Information to determine whether they are Requests for Information with the meaning of this term. If the Architect determines that the document is not a Request for Information, it will be returned to the Contractor, un-reviewed as to content, for resubmittal on the proper form and in the proper manner.

4.2.14.4 Responses to Requests for Information shall be issued within five (5) working days of receipt of the request from the Contractor unless the Architect determines that a longer time is necessary to provide an adequate response. If a longer time is determined necessary by the Owner, the Architect will within five (5) working days of the receipt of the request, notify the Contractor of the anticipated response time. The Contractor shall not be entitled to any time extension due to the time it takes the Architect to respond to the Request for Information provided that the Architect responds within reasonable promptness.

4.2.14.5 Responses from the Architect will not change any requirement in the Contract Documents. In the event the Contractor believes that a response to a Request for Information will cause a change to the requirements of the Contract Documents, the Contractor shall immediately give written notice to the Owner stating that the Contractor considers the response to be a Change Order. Failure to give such written notice immediately shall waive the contractor's right to seek additional time or cost under these General Conditions.

ARTICLE 5 - SUBCONTRACTORS

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK add the following:

5.2.1 Delete this paragraph and replace with the following:

Within twenty (20) days after the Notice to Proceed, the Contractor shall furnish to the Architect in writing, for review by the Owner and the Architect, a list of the names of all subcontractors, sub-subcontractors, fabricators, manufacturers, sources of supply, articles, devices, fixtures, pieces of equipment, materials and processes proposed for each item of work on List of Subcontractors, AIA Document G805. The Architect will promptly notify the Contractor, in writing, if either the Owner or the Architect, after due investigation, has any objection to any names on such list. Failure of the Owner or Architect to make objection promptly to any name on the list shall constitute acceptance of such name. In no event shall the Contractor substitute a subcontractor who is named by the Contractor in the bid documents. A Business Registration Certificate and a Public Works Contactor Registration Act Certificate must be furnished for each subcontractor as required by applicable law.

5.2.2.1 In submitting the names of subcontractors, the Contractor shall list 1) the extent of limitations of the trades or work included by specifications paragraph number, 2) the name and address of the subcontractor; 3) the name and address of all sub-subcontractors for each significant subdivision of the trade or work, and if required by the Architect, 4) reference in the form of a list of at least three (3) jobs similar in size and quality to this Project performed in the last five (5) years, with name and location of work, dollar value and names of the Owner and Architect.

5.2.2.2 In submitting sources in supply of materials, articles and pieces of equipment including those under subcontracts and sub-subcontracts, the Contractor shall list 1) the extent or limitations of the trades or work included by Specifications, paragraph number 2) the name and address of the source of supply 3) the name of the manufacturer of the items.

5.2.3 Delete this paragraph and replace with the following:

If the Owner or Architect has objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no objection.

5.2.4 Delete this paragraph and replace with the following:

The Contractor shall not substitute a Subcontractor, person or entity previously selected without the consent of the Owner.

5.2.5 Contractor shall defend, indemnify, and hold the Owner harmless against any claims brought by a subcontractor, supplier or any other entity, claiming a violation of N.J.S.A. 18A:18A-18 or the improper or illegal substitution of a subcontractor, supplier or other entity.

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS delete the following:

5.4.2 Delete this paragraph in its entirety.

5.4.3 Renumber paragraph to 5.4.2.

ARTICLE 6 - CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND AWARD SEPARATE CONTRACTS add the following:

6.1.4 Delete this paragraph and replace with the following:

Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12, provisions relating to Construction Schedules, and Supplemental Project Requirements relating to coordination and cooperation among Prime Contractors.

6.1.4.1 The Contractor shall coordinate all phases of the Work with the Architect and the Owner's representatives and own forces.

6.2 MUTUAL RESPONSIBILITY add the following:

6.2.3 Delete this paragraph and replace with the following:

The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities, or defective construction of the contracts, or any other cause or reason within the Contractor's contract.

6.2.4 Delete this paragraph and replace with the following:

The Contractor shall promptly remedy damage the Contractor or any of the Contractor's Subcontractors wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

6.2.4.1 Should a Contractor cause damage to the work or property of any other Contractor or Vendor on the project, the Contractor shall, upon due notice, promptly settle with such other Contractor or Vendor by agreement or otherwise resolve the dispute. If such other Contractor or Vendor sues or institutes arbitration proceedings against the Owner on account of any damage alleged to have been sustained, the Contractor shall indemnify and hold harmless the Owner and Architect and defend them in such proceeding at its own expense, and if any judgment against the Owner or Architect arises therefrom, the Contractor shall pay or satisfy it, and shall also reimburse the Owner or Architect for any

Architect's, Engineer's, and Attorney's fees and Court costs which the Owner or Architect has incurred.

6.2.6 The Contractor shall be responsible for proceeding with work in a manner that will not void any and all guarantees and warranties held by the Owner on the existing systems and facility. Contractors shall include in their Bid sufficient cost to hire a representative of the Manufacturer or Contractor covering a warranty or guaranty on existing materials to advise on, and oversee work being done that affects the warranties and guaranties so as not to void existing warranties and/or guaranties. Contractor shall comply with the Manufacturer's/Contractor's representative's requirements to maintain guaranties and warranties intact.

6.3 OWNER'S RIGHT TO CLEAN UP add the following:

Add 6.3.1 before the first paragraph.

6.3.2 This obligation shall apply to clean-ups required not only during the course of construction, but also as of completion of work. In the event that the Owner is required to incur extra costs, by way of overtime charges or otherwise in the execution of its rights under this provision, those costs shall be chargeable to the Contractor.

ARTICLE 7 - CHANGES IN THE WORK

7.1 GENERAL add the following:

7.1.4 Wherever the estimated quantities of work to be done and materials to be furnished on a unit price basis under this Contract are shown in any of the Documents including the Proposal, they are given for use in comparing Bids, and the right is expressly reserved except as herein otherwise specifically limited, to increase or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the work contemplated by this Contract and such increase or diminution shall in no way invalidate this Contract, nor shall any such increase or diminution give cause for claims or liability for damages.

7.1.5 The allowance for overhead and profit combined may vary according to the nature, extent and complexity of the work, but shall in no event exceed the following schedule:

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

In no event shall the total allowance for overhead and profit exceed 15% of the net cost of the work, including all lower tiered sub-subcontractors.

7.1.6 If the net value of a change results in a credit from the Contractor or Subcontractor, the credit given shall be the net cost without overhead or profit. The cost as used herein shall include all items of labor, materials, and equipment together with the cost of all insurance, bonds, use of small tools, incidental job burdens, general office expenses, engineering, cleaning, transportation and all other conditions referenced in the Contract

Documents. No percentages for overhead and profit will be allowed on employment taxes under FICA and FUTA that will be based on the Contractor's last quarterly 941 form. When both additions and credits are involved in any one change, the allowance for overhead and profit shall be figured on the basis of net increase, if any.

7.1.7 Where they apply, unit prices for additions or deductions as stated in the Contract Documents shall always be used as the basis for determining the cost or credit to the Owner for any changes made no matter what overall method is used for such determination.

7.1.8 Lump sum quotations for changes in the Work will not be accepted. Proposals shall be completely itemized and broken down. They shall be accompanied by such supporting data as the Architect may require such as copies of Subcontractors or Vendor's quotations quantity take-off sheets or other similar information. The Owner has the right to audit all changes and claims.

7.5 RIGHT TO AUDIT THE CONTRACTOR'S BOOKS AND RECORDS New Article:

7.5.1 The Owner shall have the right to appoint an auditor to audit and review the Contractor's financial books and records of account in connection with any claim by the Contractor, Change Order, or Construction Change Directive.

ARTICLE 8 - TIME

8.1 DEFINITIONS add the following:

8.1.5 <u>All time limits set forth in the Agreement are of the essence.</u> By executing the Agreement, the Contractor confirms that the contract time is a reasonable period for performing the Work. Work will commence within TEN (10) CALENDAR DAYS after issuance of written "Notice to Proceed" and be substantially completed in accordance with the Contract Documents and Contractors' Coordinated Construction Schedule for substantial completion of the entire Project in accordance with Section 011000 – Summary, Article 1.5 Work Phases. All time limits stated in the contract are of the essence.

8.2 PROGRESS AND COMPLETION add the following:

8.2.4 The Contractor shall furnish such manpower, materials, facilities, and equipment and shall work such hours, including night shifts, overtime operations and Sundays and holidays, as may be necessary to insure the performance and completion of the Work in accordance with the approved and currently updated and approved Schedule. Should it become apparent from the current Schedule that the Work will not be completed within the Contract Time, the Contractor agrees that he will, as necessary, take some or all of the following actions at no additional cost to the Owner or Architect and reimburse/pay for all costs, i.e., custodial fees/OT, etc. (Refer to the summary section 011000 for additional work restrictions) to improve the progress of the Project..

8.2.4.1 Increase manpower in such quantities and crafts as will substantially eliminate, in the judgment of the Architect, the backlog of Work;

8.2.4.2 Increase the number of working hours per shift, shifts per working day, working days per week, the amount of equipment, or any combination of the foregoing, sufficiently to substantially eliminate, in the judgment of the Architect, the backlog of Work; and,

8.2.4.3 Reschedule activities to achieve maximum practical concurrence of accomplishment of activities.

8.2.5 The Architect may require the Contractor to suggest revisions to the Schedule in writing demonstrating its program and proposed plan to make up the delay to ensure completion of the Work within the Contract Time. If the Architect finds the proposed plan not acceptable, the Architect may require the Contractor to take any of the actions set forth in this Article without additional cost to the Owner to make up the lag in scheduled progress.

8.2.6 Should the Contractor fail to achieve Substantial Completion in accordance with the date established in the Contract Documents, the Contractor shall reimburse the Owner for all professional fees plus expenses incurred by the Owner for additional services required of the Architect, Engineer, and Owner's Attorney resulting from the failed performance by the Contractor to meet the Contract Substantial Completion Date.

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 Delete this paragraph and replace with the following:

If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or (2) by changes ordered in the Work; or (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with section 15.1.6.2, or other causes beyond the Contractor's control; or (4) by delay authorized by the Owner pending litigation or mediation; or (5) by other causes that the Contractor asserts, and the Architect determines justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine and the Owner approve.

8.3.3 Delete this paragraph and substitute the following:

In accordance with N.J.S.A. 18A:18A-41, in no event shall the Contractor be entitled to collect damages from the Owner or Architect as a result of any Project delay not solely caused by the Owner's negligence, bad faith, active interference, tortuous conduct, or unforeseen circumstances uncontemplated by the parties, which were not otherwise foreseeable, as more particularly described in Article 8.4.4. The Contractor is aware that its ability to complete its portion of the Project could be hindered or delayed by the actions or inactions of other Contractors on the Project or other causes not attributable to the Owner's negligence, bad faith, active interference or tortuous conduct or unforeseen circumstances uncontemplated by the parties, which were not otherwise foreseeable, as more particularly described in Article 8.4.4. The Contractor's sole remedy for delays by the Owner's negligence, bad faith, active interference, tortuous conduct or unforeseen circumstances uncontemplated by the parties, which were not otherwise foreseeable, as more particularly described in Article 8.4.4 shall be the actual out of pocket expenses

incurred by the Contractor directly attributable to the delays caused solely by the Owner or unforeseen circumstances uncontemplated by the parties, which were not otherwise foreseeable, as more particularly described in Article 8.4.4. The Contractor's sole remedy for delays caused by any reason other than the Owner's negligence, bad faith, active interference, tortuous conduct or unforeseen circumstances uncontemplated by the parties, which were not otherwise foreseeable, as more particularly described in Article 8.4.4 shall be an extension of time to complete the Project.

8.3.4 To the fullest extent permitted by law, no payment, compensation or adjustment of any kind (other than the extensions of time provided for in Paragraph 8.3.1) shall be made to the Contractor by the Owner or Architect for direct, indirect, or impact damages, including but not limited to costs of acceleration or loss of revenue, overhead or profit, arising because of hindrances or delays being avoidable or unavoidable, reasonable or unreasonable, other than delays adjudicated as attributable to solely the Owner's negligence, bad faith, active interference, or tortuous conduct or unforeseen circumstances uncontemplated by the parties, which were not otherwise foreseeable, as more particularly described in Article 8.4.4. The Contractor agrees that he will make no claim against the Owner or Architect for payment, compensation, damages, mitigation of liquidated damages, or adjustment of any kind for such hindrances or delays, and will accept such extensions of time in full satisfaction for any and all alleged claims against the Owner and Architect for any and all such hindrances or delays in all cases where the Owner's negligence, bad faith, active interference, or tortuous conduct or unforeseen circumstances uncontemplated by the parties, which were not otherwise foreseeable, as more particularly described in Article 8.4.4, is not the sole cause of the delay. No additional payment will be made for reason of extension of time to any contractor in the completion of work. No claims for extra cost by any contractor will be granted by reason of the construction not being completed within the contract time.

8.3.5 The provisions of this Article shall not be so interpreted or construed as to preclude or prevent the Contractor from making and prosecuting any claim against any separate Contractor engaged by the Owner for damages alleged to have been caused or occasioned by any such separate Contractor. Any delay attributable to another contractor shall be brought by the contractor as a direct action against the delaying contractor.

8.3.6 Any delay attributable to lack of coordination or cooperation by and between the Contractor or his Subcontractors, if any, will not be recognized by the Owner as the basis for any claim for increase in any Contract Sum, but shall be settled as provided in the General and Supplementary Conditions.

8.3.7 An extension of time shall be allowed equal to the total period of any delay caused by injunction or other legal proceedings, insofar as such proceedings prevent the Contractor from proceeding with the work, but no extension shall be allowed unless such legal proceedings shall be diligently prosecuted by the Contractor and, provided further that, in no case shall such delay be deemed to begin until the Contractor shall have given written notice to the Owner of the injunction or other action of delay and shall have delivered to the Owner a copy of the injunction or other orders and the papers upon which the time shall have been granted.

8.3.8 The Owner may suspend the whole or any part of the work, if it shall deem it for the best interest of the Owner to do so, without compensation to the Contractor for such suspension other than extending the time for completion of the work as much as it may have been delayed by such suspension. During such suspension, all materials delivered upon but not placed in the work, shall be neatly piled by the Contractor so as not to obstruct public travel or shall be removed from the line of work at the direction of the Owner and, unless the materials be moved by the Contractor upon such direction, the materials shall be removed by the Owner and expense thereof will be charged to the Contractor.

8.3.9 Nothing contained herein shall preclude the Owner from recovering damages for delays pursuant to the terms of the Contract Documents, except as specifically provided herein.

8.4 LIQUIDATED DAMAGES new article add the following:

8.4.1 The Contractor shall substantially complete all of his Work included in the Contract Documents ready for the Owner's occupancy as defined in the General Conditions, in accordance with the allotted time indicated in the Contract Documents, subject to extensions of contract time as provided in the General Conditions.

8.4.2 In the event of the failure of the Contractor to complete the said work within the time stated in its proposal, and in accordance with article 8.1.5, the Contractor shall be liable to the Owner in the sum of **ONE THOUSAND ($1,000.00) DOLLARS** per day for each and every calendar day that the work remains incomplete in accordance with designated phased completions. This sum shall be treated as liquidated damages (and not a penalty) for the loss to the Owner of the use of premises in a completed state of construction, alteration or repair, and for added administration and inspection costs to the Owner on account of the delay; provided, however, that the said liquidated damages shall be in addition to other consequential losses or damages that the Owner may incur by reason of such delay, such as, but not limited to, reasonable attorney's fees, all additional consequential Architectural and Engineering fees incurred including, but not necessarily limited to, additional design work, submittal reviews, correspondence, inspections, job meetings, reviewing applications for payment, punchlists, and similar services, etc. by the Owner after the scheduled date of substantial completion as indicated in article 8.1.5, other added costs of the project and the cost of furnishing temporary services, if any. Any such sums for which the Contractor is liable may be deducted by the Owner from any monies due or to become due to the Contractor.

8.4.2.1 The Contractor agrees that said work shall be prosecuted regularly, diligently, and uninterruptedly at such rate of progress as will ensure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for the completion of the work herein is a reasonable time, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality. If the said Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration of the awarding of its contract, to pay the Owner the amount specified in the contract, not as a penalty but as liquidated damages for breach of contract as hereinafter set forth, for each and every

calendar day that the contractor may be held in default after the stipulated date in the contract for completing the work.

8.4.2.2 The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain, and said amounts shall be retained by the Owner as necessary to cover projected untimely completion of the contract work due to Contractor-caused delays.

8.4.2.3 It is further agreed that time is of the essence of each and every portion of this contract and of the specifications wherein a definite and certain length of time if fixed for the performance of any act whatsoever; and where under the contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this contract.

8.4.3 Inasmuch as certain of the expenses, inconvenience, and other damages the Owner will sustain in the event that the Contractor does not achieve Substantial Completion, within the Contract Time or extensions thereof approved by Change Order, will include all elements of loss attributable to the delay, including but not limited to amounts actually paid by the Owner for attorneys' fees, the Architect's additional services and expenses, and for other Contractor's claims for additional costs incurred as a result of the Contractor's failure to achieve Substantial Completion within the Contract Time. It will also include all other damages to the Owner for delay in completion of the Work by the Contractor, which shall be liquidated in the sum as stipulated above for each calendar day by which the Contractor shall fail to complete the Work within the Contract Time and any extensions thereof approved by Change Order. Such liquidated damages shall not be considered as a penalty. The Owner shall deduct and retain out of any money due, or become due hereunder, the amount of the liquidated damages.

8.4.4 The Contractor shall not be charged with liquidated damages, or any excess cost when the Owner determines that the contractor is without fault and the Contractor's reasons for the time extension are acceptable to the Owner; provided further, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in the completion of the work is due:

(a) To any preference, priority or allocation order duly issued by the government;

(b) To unforeseen cause(s) beyond the control and without the fault or negligence of the Contractor including, but not restricted to, acts of God or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner which acts are contrary to the terms of such contract, fires, flood, epidemics, quarantine restrictions, strikes, freight embargoes and severe weather; and

(c) To any delays of Subcontractors or Suppliers occasioned by any of the causes specified in the immediately preceding subsection (a) and (b).

(d) Unforeseen circumstances shall not include situations which are reasonably foreseeable in construction projects of similar scope and type, such as delays in connection with responses to RFI's and change orders, delays in payment to the Contractor, withholding of payment to the contractor, emergency and scheduled tests, inspections and/or abatement activities, the discovery of hazardous materials and such other circumstances which are addressed in the Project Manual, the Project Specifications or this Agreement. To the extent provided in this Agreement, such circumstances, including but not limited to those specified in this Article 8.4.4, may entitle the Contractor to an extension of time, provided said delay is beyond the control of and without the fault or negligence of the Contractor, but in no event will such circumstances entitle Contractor to pursue a claim for delay as against the Owner as they are not considered "reasons not contemplated by the parties" as referenced in N.J.S.A. 18A:18A-41.

8.4.5 The Contractor shall, within five calendar days from the beginning of such delay, unless the Owner shall grant a further period of time prior to the date of final settlement of the contract, notify the Owner in writing of the causes of the delay. The Owner shall first ascertain the facts and the extent of the delay and shall notify the Contractor within a reasonable time that good cause has been shown to warrant the granting of such extension. The Owner's determination shall be final and binding upon all parties, providing that said discretion is done in good faith and consistent with all of the terms herein.

8.4.6 Estimated liquidated damages may, at the Owner's option, be withheld from any payments otherwise due the contractor if the Contractor has failed to timely complete a critical activity, which failure has a substantial likelihood of delaying substantial completion of the project beyond the date set forth in the Contract Documents. Estimated liquidated damages shall be based on a reasonable projection, in light of the Construction Schedule, of the number of days substantial completion will be delayed beyond the scheduled substantial completion date set forth in the Contract Documents. Failure of the Owner to withhold estimated liquidated damages from payments due the Contractor shall not be deemed a waiver of liquidated or estimated liquidated damages.

ARTICLE 9 - PAYMENTS AND COMPLETION

9.1 CONTRACT SUM append the following to section 9.1.1:

The Contract sum shall include the cost of all work, labor, materials, equipment, transportation and all other things necessary to perform and complete the Project in a manner acceptable to the Owner and within the required time; all incidental expenses in connection therewith; all costs on account of loss by damage of destruction of the Work, to the extent that the Owner and Contractor do not recover the cost of such loss from insurance carrier; and any additional expenses for unforeseen difficulties encountered, settlement of damages and replacement of defective work and materials.

9.2 SCHEDULE OF VALUES add the following:

Delete the paragraph and substitute the following:

9.2.1 Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and showing a complete breakdown of labor and materials of all components of Work, including that of all Subcontractors named on the Contractor's bid form with signed affidavits from each of the said Subcontractors, and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. The Contractor shall amend the schedule of values as requested by the Architect. Any changes to the schedule of values and shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment. The Architect's decision shall be final.

9.2.2 Claims for escalation from prices submitted at the time of bid for work included in the original scope of work at the time of bid, including alternate bid and unit prices, will be prohibited.

9.3 APPLICATION FOR PAYMENT add the following:

9.3.1.3 Applications for payment shall be made monthly based upon labor and materials completed and materials suitably stored on site. Two-Percent (2%) of the amount due on each partial payment shall be withheld by the Owner when the outstanding balance of the Contract exceeds $500,000.00, and Five percent (5%) of the amount due on each partial payment shall be held by the Owner when the outstanding balance of the contract is $500,000.00 or less in accordance with N.J.S.A.18A:18A-40.3. Requisitions for all payments will be made on AIA Document G702 Application and Certificate for Payment, in addition to the Owner's Invoice Forms as required. Contractor will be required to submit an itemized, detailed cost breakdown showing quantities, unit costs, and totals to the Architect within twenty (20) days after Notice to Proceed. Form to be in conformance with Architect's requirements.

9.3.2 Delete this paragraph and substitute the following:

Payments on account of materials or equipment not incorporated in the Work but delivered and suitably stored at the site, or at some other location agreed upon in writing, may be made electively and purely upon the discretion of the Owner with the advice of the Architect and subject to the following conditions:

.1 Such materials or equipment shall have been fabricated or assembled specifically for the Project and delivered to storage no earlier than needed for the orderly progress of the Work as demonstrated by the Progress Schedule.

.2 Title to such materials or equipment shall pass to the Owner pursuant to the Contractor's bill of sale which shall contain guarantee of replacement thereof in the event of damage thereto or disappearance thereof due to any cause. The Contractor

shall also affirm that he will pay for such materials or equipment immediately upon receipt of payment therefor from the Owner.

.3 If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

.4 Raw materials or other materials or equipment readily duplicated or usable on other projects will be paid only after the materials are incorporated in the construction.

.5 The Owner reserves the right to deny a request, without explanation, for payment for stored materials or equipment. The failure of the Owner to respond to a request by a Contractor for payment for stored materials shall be deemed as a denial of that request.

.6 Payments which are made for stored materials or equipment shall include only the net cost of the materials or equipment plus cost of delivery, if applicable to the point of storage. Payments for overhead, profit and other job costs shall be made only in accordance with Section 9.3.1.

.7 Affidavits, in form acceptable to the Architect, shall be furnished with each application for payment in which payment is being requested for stored materials. Separate affidavits shall be furnished for each location where items are being stored.

.8 With each affidavit the Contractor shall submit sufficient documentation to demonstrate that the stored materials have been received by the Contractor. The Architect shall be the sole judge as to the adequacy of this documentation and shall, at his option, be permitted access to all areas where these materials are to be stored to perform any inspections he deems necessary.

.9 Payment will NOT be made for materials stored off-site.

9.3.4 Contractor further warrants that upon submittal of an Application for Payment, all Subcontractors and Sub-Subcontractors who performed work for which certificates of payment have been previously issued and payments received from the owner have in fact been paid for such work.

.1 Contractor hereby waives any right which it may have to assert a mechanics' or other lien against the work, the project site, and any improvements thereon. Further, the Contractor shall cause a similar waiver to be included in all of its Subcontract and Sub-Subcontracts. Contractor shall also execute a separate waiver of liens if so requested by the Owner.

.2 Contractor shall defend, indemnify, and hold Owner and Architect harmless from and against any and all claims, actions and proceedings arising out of or related to any liens asserted against the work, the project site and any improvements thereon, or the payments due the Contractor under this agreement. As complete indemnification is intended, all costs and expenses, including reasonable

attorney's fees, incurred by the Owner, and Architect in enforcing this provision shall be reimbursed by the Contractor to the Owner.

9.4 CERTIFICATES FOR PAYMENT

9.4.1 Delete the entire paragraph and substitute the following:

Provided the Prime Contractor has performed work in accordance with the provisions of its Contract with the Owner, the Architect will, after receipt of the Contractor's Certified Application for Payment (not the preliminary pencil copy), either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Owner and Contractor in writing of the Architects reasons for withholding certification in whole or in part as provided in paragraph 9.5.1 of the General Conditions of the Contract for Construction. Provided the Contractor's Certified Application for Payment (not the preliminary pencil copy) is received no less than 20 days prior to the next scheduled meeting of the entity's governing body the amount due may be approved and certified at the scheduled meeting of the entity to be paid during the entity's subsequent payment cycle, not to exceed 30 days. If an Application for Payment is received by the Owner and Architect after the 20 day period prior to the scheduled meeting of the entity's governing body, the amount due may be approved and certified at the next subsequent scheduled meeting of the entity's governing body and subsequent payment cycle.

9.5 DECISIONS TO WITHHOLD CERTIFICATION add the following:

9.5.1.7 Delete the entire paragraph and substitute the following:

repeated failure to carry out the Work in accordance with the Contract Documents; or

9.5.1.8 failure to maintain the site in a safe and satisfactory manner in accordance with the Contract Documents and/or law as determined by the Architect.

9.5.2.1 If the Owner is entitled to any reimbursement or payment from the Contractor under or pursuant to the Contract Documents, such payment shall be made promptly upon demand by the Owner. Unless otherwise stated in the Contract Documents, if the Contractor fails to promptly make any payment due the Owner, or the Owner incurs any expenses due to the Contractor's acts and omissions, the Contractor, including but not limited to additional services of the Architect and reasonable attorney's fees, the Owner shall have an absolute right to offset such amount against the Contract Sum and may, in the Owner's sole discretion, elect either to: (1) deduct an amount equal to that which the Owner is entitled from any payment due the Contractor, or (2) issue a written notice to the Contractor reducing the Contract Sum by an amount equal to that which the Owner is entitled.

9.7 FAILURE OF PAYMENT Delete the entire paragraph and substitute the following::

9.7.1 If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within the time specified in 9.4.1, or if the Owner does not pay the Contractor by the date established in the Contract Documents the amount certified by the Architect

or awarded by binding dispute resolution, then the Contractor may, upon seven (7) additional days' written notice to the Owner and Architect, suspend performance of the Construction Contract until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up which shall be accomplished as provided in Article 7.

9.7.1.1 This provision is a permissible exception to the requirements set forth in N.J.S.A. 2A:30A-2. All disputes regarding whether a party has failed to make payments pursuant to N.J.S.A. 2A:30A-1 et seq. may be submitted to a process of alternative dispute resolution.

9.8 SUBSTANTIAL COMPLETION add the following:

9.8.1.1 When the work, or designated portion thereof is determined by the Architect in conjunction with the Owner to be substantially complete and has received a temporary or permanent Certificate of Occupancy or Certificate of Approval, the Architect will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the day of the Substantial Completion of the Work or designated portion thereof unless provided in the Certificate of Substantial Completion. The Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such certificate.

9.8.2 Delete the entire paragraph and substitute the following:

When the Contractor considers that the work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of all items to be completed or corrected. Failure to include any item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Together with this list, the Contractor shall provide a written request to the Architect to perform an inspection of the Work.

9.8.3 Delete the entire paragraph and substitute the following:

Upon receipt of the Contractor's request, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses additional items, whether or not included on the Contractor's list, which are not sufficiently completed or corrected in accordance with the Contract Documents, the Contractor shall, before issuance of the Certificate of Substantial Completion, promptly complete or correct such items. All items must be corrected by the Contractor within fourteen (14) days after receipt of the list from the Architect or within an acceptable time frame established by the Contractor and Architect and approved by the Architect. Upon completion of those items the Contractor shall request, in writing, a re-inspection of the Work. This re-inspection shall commence

within fourteen (14) days after receipt of notice. If upon the re-inspection, the Architect finds that the previous items, or new items, do not conform to the Construction Documents, a revised list shall be provided to the Contractor within seven (7) days. This sequence of actions shall take place until all items conform to the Contract Documents. The Contractor shall be liable to reimburse the Owner, by means of a Change Order, for all costs and fees of the Architect, Engineers, and all professionals associated with re-inspections of Work beyond one (1) initial inspection and one (1) re-inspection of the Work.

9.8.3.1 If during the sequences of inspection and correction of Work, the Contractor defaults or neglects to carry out the correction of Work in accordance with the time frames established in 9.8.2 or in accordance the approved schedule of correction, the Contractor shall be considered in default and the Owner may exercise all rights under these Contract Documents. This shall also include Article 2.4 – Owner's Right To Carry Out The Work.

9.9 PARTIAL OCCUPANCY OR USE add the following:

9.9.3 Delete the entire paragraph and substitute the following:

Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents, nor does it waive the Owner's right to liquidated and actual damages described in Article 8.4.5 because Final Acceptance of the Work shall be for the entire work only and not in part.

9.10 FINAL COMPLETION AND FINAL PAYMENT add the following:

9.10.4 Delete these sub paragraphs and substitute the following:

.2 failure of the Work to comply with the requirements of the Contract Documents;

.3 terms of special warranties required by the Contract Documents; or

.4 insufficiency of or failure to provide requisite close-out documents.

9.10.6 Prior to final payment, Contractor will submit, but not limited to the following:

.1 Supplemental Attachment for Accord Certificate of Insurance - AIA Document G715.

.2 Affidavit of Payment of Debts and Claims - AIA Document G706.

.3 Affidavit of Release of Liens - AIA Document G706A.

.4 Consent of Surety to Final Payment - AIA Document G707.

.5 Certification of Paid Wages in accordance with New Jersey Prevailing Wage Act.

.6 Maintenance Bond in form as bound herein.

.7 Contractor's "As-Built" drawings on CD.

.8 Maintenance Manuals and Instructions.

.9 Special written guarantees and warranties in addition to the guarantee covered by Maintenance Bond. Guarantee shall be signed and sealed by Officer of the Contracting Firm and shall be notarized.

.10 Fully Executed AIA Substantial Completion Form G-704.

9.10.7 Upon completion of the punchlist and all other required scope of work have been completed in accordance with the Contract Documents, the Contractor shall submit a written request certifying that the project is ready for final inspection by the Architect. A copy of the "Ready For Closeout" form is included in 009000 – Project Forms.

ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS add the following:

10.1.1 The Contractor is required to establish, maintain, and implement effective programs to ensure compliance with all OSHA regulations, in addition to the Hazard Communication Standard, and advise the Architect regarding the location, on site, where the Contractor's MSDS sheets are kept. The Contractor will provide the Architect (for informational purposes only) with all information regarding any precautionary measures that the relative Contractor must employ to protect employees, any foreseeable emergency situations, and the relative Contractor's labeling system used at the work site. The Contractor is also required to provide this information to the Owner and other entities operating at the site, and to secure similar information from the other entities operating at the site, for the protection of all employees.

10.1.2 Neither the Owner, nor the Architect will be responsible for providing, maintaining or enforcing a safe working place for the Contractors, their Subcontractors or their employees, or any individual responsible to them for the work.

10.1.3 Neither the professional activities of the Architect, nor the presence of the Architect or the Architect's employees and sub-consultants at a construction site, shall relieve the Contractor and any other entity of their obligations, duties, and responsibilities including, but not limited to, construction means, methods, sequences, techniques, or procedures necessary for performing, superintending, or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Architect and Architect's personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for job site safety, and warrants that this intent shall be made evident in the Owner's agreement with the Contractor. The Owner, the Architect and the Architect's consultants shall be defendant and indemnified and shall be made additional insured under the Contractor's general liability insurance policy.

10.1.4 The Contractor shall enforce strict discipline and good order at all times among Contractor's employees and all subcontractors. Contractor's employees and subcontractors shall dress in clothing appropriate to the work they perform. Contractor shall not engage any employee not skilled in a task assigned. All employees assigned to

the Work by Contractor shall perform in the best manner and shall cooperate fully with the Owner and all other representatives of the Owner.

10.1.5 Smoking on the Owner's Property/Project Limits shall be prohibited. Contractor's employees shall avoid communications with students or teachers except to the extent necessary to implement safety measures.

10.1.6 At no time will the Contractor be permitted to work in any manner above occupied areas.

10.1.7 Contractor understands that the Project is an educational facility which may be fully or partially occupied and utilized by teachers and students. The Contractor shall take into consideration that the students utilizing or attending the educational facility are susceptible to the hazards of attractive nuisance or other hazards present on construction sites and shall take any and all necessary precautions.

10.1.8 It is absolutely prohibited for any worker to act in any manner which would be deemed injurious to the students or faculty or inappropriate within the school facility or setting. At the request of the Owner, which shall only be made for cause, the Contractor shall remove any employee from the Work, Project and site. No alcoholic beverages or other prohibited substances shall be permitted or consumed on school property.

10.2 SAFETY OF PERSONS AND PROPERTY add the following:

10.2.2 Delete the entire paragraph and substitute the following:

The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, including, but not limited to, the Federal Occupational Safety and Health Act of 1970 and amendments thereto, bearing on safety of persons or property or their protection from damage, injury or loss. The Contractor shall conform to requirements of the Federal Occupational Safety and Health Act, and the Construction Safety Code. The requirements of the State, Local and Association Codes shall apply where they are equal to or more restrictive than the requirements of the Federal Act.

10.2.2.1 The Contractor will be responsible for providing general safeguarding as well as gaining compliance with the requirements of safety codes and ordinances and coordinating with all Contractors on the Project in accordance with N.J.S.A. 34:5-166 et seq. the State of New Jersey Construction Safety Code.

10.2.2.2 The Contractor shall comply with the requirements of the latest edition of the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America, Inc., provided that if any such provisions disagrees with that of an applicable law, regulation or code, the Contractor shall comply with the safer or more stringent provisions.

10.2.2.3 The Contractor shall submit with its bid an OSHA Safety Certification on the form included in these specifications, certifying evidence that a full time representative shall be on site who shall have completed or be currently enrolled in an OSHA safety training

program (30 hour OSHA certified program or equivalent program) which shall be acceptable to the Owner.

10.2.2.4 The Contractor shall obtain Material Safety Data Sheets (M.S.D.S.) for all material to be used on site and prior to material being brought on site. The Contractor shall maintain Material Safety Data Sheets and make them available for inspection to everyone as required by law.

10.2.2.5 The Contractor shall hold weekly safety meetings with its subcontractors to provide for the safeguarding of persons and property. The Contractor shall record minutes of the meetings and submit copies to the owner on a weekly basis for the record.

10.2.2.6 The Contractor shall provide the Owner, at the initial project meeting, a written safety program and hazard communication program as required by OSHA.

10.2.3.1 The General Contractor is responsible for maintaining the fenced construction area for the duration of the project including general trash removal and maintaining the grass if applicable.

10.2.4.1 If reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing. The work shall not be resumed except by written directive by the Owner.

10.2.5.1 The Contractor shall protect all materials and equipment for which he is responsible, which is stored at the Project Site for incorporation in the work, or which has been incorporated into the work. He shall replace all such materials and equipment which may be lost, stolen, or damaged at his expense, whether or not such materials or equipment have been entirely or partially paid for by the Owner.

10.2.6.1 In an effort to promote a safe and drug free workplace, contractor and its subcontractors shall be required to have a drug and alcohol testing program whereby employees will be required to submit to random drug and alcohol testing to the extent permitted by law. The contractor shall provide signs (12" x 24") at all pedestrian points of entry into the construction site which states, "All workers entering this site acknowledge that this is a drug and alcohol free environment and may be subject to random drug and alcohol testing". Drug and alcohol testing shall also be conducted by contractor or subcontractor at the Owner’s request, where the Owner or its representative has a reasonable suspicion to believe that an employee of the contractor or subcontractor is under the influence of drugs or alcohol. All testing shall be done at the contractor or subcontractor’s sole expense.

10.2.7 Delete the entire paragraph and substitute the following:

The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition. Prior to bringing any fill material onto the Project, the Contractor shall have the material tested and provide certification that the material is clean and free from environmental contamination.

10.2.7.1 The Contractor shall conduct daily comprehensive safety inspections of the work site and submit to the Architect weekly reports indicating the results conclusions and actions taken as a result of the inspections and any findings of non-conformance with current O.S.H.A. standards.

10.2.7.2 The Contractor shall stop work and immediately remedy any and all safety infractions brought to their attention by the Owner or Architect or governing authorities having jurisdiction over the project. Any time lost as a result of safety violations shall not be grounds for delay or time extensions to the contract.

10.2.7.3 The Contractor shall remove snow or ice from the site, as required to provide safe access to the work.

10.2.7.4 It is a requirement of this Contract that there is an absence of mold in the final product, and that best practices for prevention be followed. Actual remediation, if required, shall be performed by mold remediation experts hired by the responsible Contractor.

10.2.7.5 The General Contractor is responsible for maintaining the fenced construction area for the duration of the project including general trash removal and maintaining the grass if applicable.

10.2.8 Substitute “48 hours” in place of “21 days”.

10.3 HAZARDOUS MATERIALS Add the following:

10.3.1.1 Add the following:

The Contractor will report the condition to the Owner and Architect in writing. The Work in the affected area shall not thereafter be resumed except by written directive of the Owner.

10.3.2 Delete the entire paragraph and substitute the following:

Upon receipt of the Contractor’s written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately.

10.3.3 Delete the entire paragraph and substitute the following:

To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect’s consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys’ fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death,

or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity, including, but not limited to, the Contractor, Architect, Architect's consultants and/or agents and employees of any of them.

10.3.4 Delete the last sentence of the paragraph.

10.3.6 Append the following:

Nothing contained herein shall be construed to require the Owner to indemnify the Contractor where the Contractor performs the work out of sequence or at a time other than that indicated in the Construction Schedule.

10.3.7 ASBESTOS

10.3.7.1 Any Contractor performing any type of renovation or construction in or around existing buildings must contact the environmental services department of the Owner to be informed of the district's asbestos procedures.

10.3.7.2 Each Contractor shall anticipate in his bid, extra time required to coordinate with the Owner for removal of any asbestos encountered during demolition work associated with this project.

10.3.7.3 Any Contractor disturbing or damaging any asbestos identified will be totally responsible for its repair and/or removal in accordance with applicable laws and regulations at no additional cost to the Owner and in conformance with N.J.A.C. 5:23-8.1 et seq. Asbestos Hazard Abatement Subcode. The Contractor shall be solely responsible for the payment of any and all fines and penalties which may be assessed against the Owner in connection with the disturbance or damaging of any asbestos containing materials.

10.3.8 VOLATILE ORGANIC COMPOUNDS (VOC)

10.3.8.1 All materials used on this Project shall comply with all applicable governmental and local VOC requirements.

10.4 EMERGENCIES add the following:

Prior to first paragraph add 10.4.1

10.4.2 The Contractor must provide, with their executed Contract Agreement, a list of home or mobile telephone numbers for those personnel who would be contacted in the event of any emergency at the project during non-business working hours.

ARTICLE 11 – INSURANCE AND BONDS delete the entire contents of the Article and replace with the following paragraphs:

11.1 CONTRACTOR'S INSURANCE AND BONDS add the following:

11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located and rated "A" or better by A.M. Best Company such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, including acts of joint negligence between the Owner and/or Architect and those entities previously mentioned:

.1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed, including private entities performing Work at the site and exempt from the coverage on account of number of employees or occupation, which entities shall maintain voluntary compensation coverage at the same limits specified for mandatory coverage for the duration of the Project;

.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;

.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees, or persons or entities excluded by statute from the requirements of Clause 11.1.1.1 but required by the Contract Documents to provide the insurance required by the Clause;

.4 Claims for damages insured by usual personal injury liability coverage;

.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

.6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;

.7 Claims for bodily injury or property damage arising out of completed operations;

.8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18; and

.9 claims for damage because of hazardous operations including but not limited to, explosion, collapse and underground property damage.

11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents. The policy shall be written on an occurrence basis, not on a claims made basis.

11.1.3 Certificates of insurance and endorsements indicating that the coverage is primary, noncontributory (meaning the insurance provides primary coverage in connection with personal injury, death and/or property damage caused in whole or in part by the Contractor, its employees, agents, officers and/or subcontractors in connection with the project), which are acceptable to the Owner within seven (7) days of the Agreement and shall be filed with the Owner (with copies to the Architect) prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire and the limits will not be reduced until at least thirty (30) days' prior written notice has been given to the Owner via certified mail, return receipt requested. Additionally, these certificates and policies shall name the Owner, the Architect and the Engineer and their consultants, as additional named insureds and the certificate(s) of insurance or policy endorsements, as appropriate, shall indicate that coverage provided to the additional insureds is primary, non-contributory coverage. In the event of cancellation, the Contractor shall obtain insurance in the same amount and for the same coverage from another carrier prior to the date of cancellation. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning change in coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor no later than the effective date of the change in coverage.

11.1.4 The Contractor shall ensure that each of his subcontractors, procures and maintains during the life of his subcontract the insurance coverages of the type and in the same amounts as specified in this Article or shall insure the activities of his subcontractors in his own policy. Proof of insurance by way of certificates to be supplied to the Owner and copies to the Architect as required by section 11.1.3.

11.1.4.1 The Contractor shall defend and indemnify the Owner, the Architect, and the Engineers and their consultants and respective officers, agents and employees as provided in Article 3.18. The indemnified parties may defend themselves, at the Contractor's expense, from any claim or lawsuit which may arise out of the Contractor's performance or lack of performance under the terms of this contract or they may elect to have the Contractor provide them with legal representation at the Contractor's own expense.

11.1.5 The insurance required pursuant to this Article shall be written in the following minimum limits of liability and shall be in the names of the Contractor, the Owner, the Architect and the Engineers, as their interest may appear. The amounts set forth in this section may be increased, in which case a Supplementary Schedule of Minimum Insurance Limits of Liability shall be included in the Contract Documents setting forth such increased limits.

The minimum insurance coverage required by the Board to be maintained by the successful bidder through either insurance policies from insurance companies licensed to do business in the State and rated A or better by A.M. Best Company, or through formal fully funded self-insurance programs authorized by law as follows:

.1 Workers Compensation: (in accordance with the laws of New Jersey and any other jurisdiction required to protect employees of the Board and any and all Contracted Parties who will be engaged in the performance of the work on this project)

Applicable Federal, State:	Statutory
Employers' Liability	$1,000,000.00 (each accident)
Disease - Each Employee	$1,000,000.00
Disease – Policy Limit	$1,000,000.00

.2 Contractor's Liability Insurance: covering any and all bodily injury and property damage arising out of or in connection with the work performed hereunder (including coverage for premises, operations, explosions, collapse and underground operations, independent contractor protection, sublet work, elevators, contractual liability, broad form property damage, products liability and completed operations) and personal injury (with employment exclusion deleted):

a. Comprehensive General Liability and Comprehensive Automobile Liability:

General Liability - Combined single limit as follows:

Each Occurrence	$1,000,000.00
Aggregate	$2,000,000.00

Automobile Liability (Owned, Non-Owned and Hired/ Combined Single Limit):

Each Occurrence	$1,000,000.00
Each Person	$1,000,000.00

.3 Excess Umbrella Liability: $5,000,000.00

Excess liability shall have a drop down provision to cover over $1,000,000 of Employers' Liability section of Workers' Compensation listed above.

.4 Contractual Liability Endorsement (Bodily Injury and Property Damage Combined):

Each Occurrence $2,000,000.00

.5 Completed Operations & Products Liability*:

Aggregate $2,000,000.00

*Maintain until one year after issuance of Final Certificate of Payment.

.6 Asbestos Abatement Liability Insurance:

In addition to the insurance requirements in the General Conditions, the Contractor licensed to perform Asbestos Abatement work shall purchase from and maintain in a

company or companies lawfully authorized to do business in the jurisdiction in which the Project site is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by anyone directly employed by any of them, or by anyone for whose acts any of them may be liable. Provide Contractor's Asbestos Abatement Liability in the occurrence form as follows:

Each Occurrence	$1,000,000.00
Aggregate	$1,000,000.00
Excess Umbrella Liability:	$5,000,000.00

All insurance required by this Section or any other insurance required by the Contract Documents shall identify the Owner, the Owner's Architect, and the Asbestos Abatement Consultant each as an "additional insured".

11.1.6 The above insurance policies shall:

(a) include an indemnification provision as specified in Article 3.18,

(b) include completed operation coverage, and

(c) Not be subject to any of the special property damage liability exclusions: explosion, collapse, damage to underground wires, piping and conduits which are commonly referred to as the XCU exclusions, and Certificates of Insurance furnished by the Contractor shall show by specific reference that each of the foregoing items has been provided for.

11.1.7 The insurance required by paragraph 11.1 is not intended to cover machinery, tools or equipment owned or rented by the Contractor which are utilized in the performance of the Work but not incorporated into the permanent improvements. The Contractor shall, at the Contractor's expense, provide insurance coverage for owned or rented machinery, tools or equipment.

11.1.8 The above policies for Comprehensive General Liability must be so written as to include Contingent Contractor's Insurance to protect the Contractor against claims arising from the operations of Subcontractors.

11.1.9 The Certificates of Insurance furnished by the Contractor and Subcontractor shall include a clause obligating the insurer to give the Owner and each additional insured thirty (30) days prior to written notice of the cancellation of or any material change in the insurance coverage and endorsements to the policies. Policies expiring on a fixed date before Final Acceptance shall be renewed and filed with the Owner before the expiration date.

11.1.10 Nothing contained herein shall be interpreted to relieve the Contractor of his obligation to complete the work without additional cost to the Owner beyond the Contract Amount. Any loss or cost of repair not covered or not fully covered by insurance shall be borne by the Contractor without additional cost to the Owner beyond the Contract Amount. The

Contractor will be responsible to cover all theft or vandalism costs to repair or replace materials including labor.

11.1.11 Contractor shall assume full responsibility and liability for any and all injuries to any person and any and all damages to any property resulting from or in connection with the project which are caused by any error, omission, or negligent act of the Contractor, its agents and employees, and any Subcontractor which he may employ.

11.1.12 To the extent that any of the foregoing provisions are inconsistent with the insurance requirements set forth in the Project Manual, the foregoing provisions shall govern. The insurance provided by the Contractor and its subcontractors shall comply with all requirements which may be imposed by the State of New Jersey or any of its agencies with jurisdiction over this Project. In the event the contractor is required by the Owner or the State of New Jersey or its agencies to provide additional insurance, said insurance shall be provided by contractor at contractor's expense.

11.1.13 Builders Risk Insurance: T**he Contractor** shall obtain and maintain Builder's Risk Insurance, providing coverage for (all risk) of physical loss or damage to the property described hereunder in an amount equal to 100% of the completed value of the work contracted herein; excepting excavations, foundations and other structures customarily excluded by such insurance. The policy shall name the Owner as additional insured and loss payee as their interests may appear.

11.2 OWNER'S LIABILITY INSURANCE

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

11.3 PROPERTY INSURANCE

11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by

enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

11.3.1.1.1 The term "extended coverage" shall be deemed to include coverage against lightning, wind, hail, riots and civil commotion, vehicle damage, aircraft damage and smoke, exclusive of theft and vandalism. The "All Risk" Insurance coverage shall also include the interests of the Architect.

11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

11.3.1.6 The fact that the Owner is furnishing All Risk Insurance shall not be interpreted to relieve the Contractor of its obligation to complete the work without additional cost to the Owner beyond the Contract Amount. Any loss or cost of repair not covered or not fully covered by insurance shall be borne by the Contractor without additional cost to the Owner beyond the Contract Amount. The Contractor will be responsible to cover all theft or vandalism costs to repair or replace materials including labor.

11.3.1.7 The Contractor may carry whatever additional insurance he deems necessary to protect himself against hazards [not covered by the Owner's All Risk Insurance] and against loss of owned or rented capital equipment and tools owned by mechanics or any tools, equipment, scaffolding, staging, towers, and forms owned or rented by the Contractor, the capital value of which is not included in the cost of work.

11.3.3 LOSS OF USE INSURANCE

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

however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

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

11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

11.3.7 WAIVERS OF SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

11.3.7.1 If during the Project construction. The Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project three policy or policies other than those insuring the Project during the construction period, the Owner waives all rights in accordance with the terms of section

11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance.

11.4 PERFORMANCE BOND AND PAYMENT BOND

11.4.1 The Contractor shall furnish a Performance Bond and a Labor and Material Payment Bond each in the full amount of the Contract sum for faithful performance and payment obligations arising thereunder as stipulated in the bidding requirements, in a form satisfactory to the Owner and consistent with New Jersey Statutes.

11.4.2 upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

The Contractor shall require the attorney in fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of his Power of Attorney.

11.4.2.1 Each Contractor will be required to furnish the Owner with a **two (2) year** maintenance bond in the amount of 100% of the final adjusted Contract Sum commencing upon the date the Final Application for Payment is accepted by the Owner.

11.4.3 Additional or Substitute Bond

11.4.3.1 If at any given time the Owner, for justifiable cause, shall be or become dissatisfied with the Surety or Sureties for the Performance and/or Payment Bonds, the Contractor shall within five (5) days after notice from the Owner to do so, substitute an acceptable Bond (or Bonds) in such form and sum and signed by such other Surety or Sureties as may be satisfactory to the Owner. The premiums on such Bond shall be paid by the Contractor. No further sums shall be deemed due nor shall be made until the new Surety or Sureties shall have furnished such an acceptable Bond to the Owner.

ARTICLE 12 – UNCOVERING AND CORRECTION OF WORK

12.1 UNCOVERING OF WORK add the following:

12.1.1 Delete the entire paragraph and substitute the following:

If any portion of the Work should be covered contrary to the request of the Architect or to requirements specifically expressed in the Contract Documents, it shall, if required by public authority or the Architect, be uncovered for observation, inspection, testing or approval and the work shall be replaced at the Contractor's expense without change in the contract time.

12.2 CORRECTION OF WORK add the following:

12.2.1 Append the following to the end of the paragraph;

Nothing contained herein shall be construed so as to prohibit the Owner from withholding payment to the extent as may be necessary to protect against loss on account of defective work not remedied or any form of payment claims against the Contractor that may subsequently have accrued

12.2.2.1 Delete the entire paragraph and substitute the following:

In addition to the Contractor's obligations under Section 3.5, if, within two-year after the date of the Final Application for Payment is accepted by the Owner or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the two-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

12.2.2.2 Delete the entire paragraph and substitute the following:

The **two-year** period for correction of Work shall be extended with respect to portions of Work first performed after the date the Final Application for Payment is accepted by the Owner by the period of time between the date the Final Application for Payment is accepted by the Owner and the actual completion of that portion of the Work.

12.2.4.1 The Contractor shall protect all material and equipment for which he is responsible, stored at the site for incorporation or which has been incorporated in the work. The Contractor shall replace all material and equipment, which may be lost or stolen at his expense whether or not it has been entirely or partially paid for by the Owner.

ARTICLE 13 – MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW delete the text of the paragraph 13.1 and substitute and add the following:

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

13.1.2 The Contractor shall comply with all applicable federal, state and local laws, statutes, regulations and ordinances and any order issued by every governmental entity with jurisdiction over the Project.

13.1.3 Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and, if through mistake or otherwise, and any provisions is not inserted, or is not correctly inserted, then upon the application of either party the Contract shall forthwith be physically amended to make such insertion or correction.

13.2 SUCCESSORS AND ASSIGNS

13.2.2 Delete the text of the paragraph and substitute the following:

The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project or to the State of New Jersey or any subsidiary Department or Agency without consent of the Contractor. In such event, the assignee shall assume the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

13.5 INTEREST

Delete the text of the paragraph and substitute the following:

13.5.1 No interest shall be paid on unpaid balances except to the extent required by and, in that event, in such amounts as specified in P.L. 2006, Ch. 96, codified as N.J.S.A. 2A:30A-1 to -2.

ARTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT.

14.1 TERMINATION BY THE CONTRACTOR

14.1.1.3 Delete the entire paragraph.

14.1.1.4 Delete the entire paragraph.

14.1.2 Delete the entire paragraph.

14.1.3 Delete the text of the paragraph and substitute the following:

If one of the reasons described in Section 14.1.1 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, but under no circumstances shall the Contractor entitled to recover any overhead and profit on Work not executed or costs incurred by reason of such termination.

14.1.4 Delete the entire paragraph.

14.2 TERMINATION BY THE OWNER FOR CAUSE

14.2.1 Add the following:

.5 If Contractor is adjudged bankrupt or insolvent, subject to the provision of the National Bankruptcy Act, specifically 11 U.S.C. 101 et seq.

.6 If Contractor makes a general assignment for the benefit of creditors.

.7 If a trustee or receiver is appointed for Contractor or for any of Contractor's property.

.8 If Contractor files a petition to take advantage of any debtor's act, or to reorganize under the bankruptcy or similar laws.

.9 If Contractor disregards the authority of the Architect or directives of the Architect.

.10 If the Contractor interferes with the work of, or otherwise fails to cooperate with, any other contractor on the Project or the Owner's own forces.

.11 If the Contractor fails to comply with the directives of the Owner or otherwise fails to perform its obligations in accordance with the Owner's concept of the Project.

.12 If the Contractor fails to adhere to the Contract Schedule or otherwise disregards any provision of the Contract Documents which makes time of the essence.

14.2.3 Delete the text of the paragraph and substitute the following:

When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished. In addition to the Owner's other legal remedies, in the event the Contractor otherwise violates any provisions of the Contract Documents, the Owner may, after giving Contractor and his Surety seven (7) days' written notice, terminate the services of Contractor, exclude Contractor from the site and take possession of the Work and of all Contractor's tools, appliances, construction equipment and machinery at the site and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion), incorporate in the Work, all materials and equipment stored elsewhere, and finish the Work as Owner may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds the direct and indirect costs of completing the Work, including compensation for additional professional services, such excess shall be paid to Contractor. If such costs exceed such unpaid balance, Contractor shall pay the difference to Owner. Such costs incurred by Owner shall be verified by Architect and incorporated in a Change Order, but in finishing the Work, Owner shall not be required to obtain the lowest figure for the Work performed.

Where Contractor's services have been so terminated by Owner, the termination shall not affect any rights of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE add the following:

14.3.3 Should the Owner be prevented or enjoined from proceeding with work or from authorizing its performance either before or after its performance, by reason of any litigation, labor dispute, etc., the Contractor shall not be entitled to make or assert claim for damage by reason of said delay, but Time for completion of the Work will be extended to such reasonable time as the Architect may determine will compensate for time lost by such delay with such determination to be set forth in writing.

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

14.4.3 Append the following:

No other payment of any kind shall be due from Contractor.

ARTICLE 15 – CLAIMS AND DISPUTES.

15.1 CLAIMS add the following subparagraphs:

15.1.6.3 Any claim for an extension, or extensions, of time must be fully substantiated by incorporation of the impact from the changed condition into an update of the Contractor's project schedule. This update must also reflect any other impacts to the schedule resulting from delays, concurrent or non-concurrent, for which any Contractor is responsible. No claims will be evaluated or accepted without inclusion of the substantiation requirements set forth in this section.

15.1.7 Delete Waiver of Claims for Consequential Damages in its entirety and substitute the following:

The Contractor waives claims against Owner, Architect, Architect's consultants, and agents and employees of any of them for consequential damages arising out of or relating to this Contract or Agreement. This waiver includes damages incurred by the Contractor including but not limited to principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit. This waiver is applicable, without limitation, to all consequential damages claims due to any termination of the Contractor in accordance with Article 14.

Nothing contained in this section shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

15.2 INITIAL DECISION add the following subparagraphs:

15.2.1 Delete the text of the paragraph and substitute the following:

Claims, excluding those arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise expressly indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If and initial decision is not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner (and its consultants).

15.2.5 Delete the text of the paragraph and substitute the following:

The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) , notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of

any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to litigation in a court of competent jurisdiction.

15.2.9 If the initial decision of the Architect is not satisfactory to the Contractor making the claim, the Contractor shall diligently perform the work as directed and shall keep an accurate accounting of all time and materials required to perform the contract.

15.3 MEDIATION add the following:

Substitute “litigation” for “finding dispute resolution” throughout

15.4 ARBITRATION

Delete this Article titled “Arbitration” and all references to Arbitration as set forth in A.I.A. Document A201, as this article is hereby deleted from the said document and this Agreement.

After the parties have complied with the previous sections of the agreement and they still have not resolved the issue, the exclusive and sole jurisdiction for all disputes shall be in the Superior Court of New Jersey and will not be subject to arbitration. Unless otherwise agreed in writing, the Contractor shall carry on the Work and maintain its progress during any mediation or legal proceedings. The prevailing party will be entailed to receive attorney fees and all costs associated with such dispute.

END SECTION 006230.

SECTION 009000 – PROJECT FORMS

Project Forms included in this section are provided for Contractor's use when forwarding Requests for Information, Job Meeting Reports, Substitution Submittals, and request when Ready for Closeout form. Contractors shall use these forms exclusively. Contractors' personal forms are not acceptable.

END OF SECTION 009000

REQUEST FOR INFORMATION

RFI # _____ **CONTRACT NO. _____**

Information Needed:	Date Needed:

Requested By/Company: _____ Date: _____

Response:

Response Prepared By: _____ Date: _____

JOB MEETING REPORT

Project:		
Contractor:		
Job Meeting Report No.	Date:	Comm. No.
Contract No./Work		Page:

Work Accomplished Previous Period:

Work Scheduled Next Period:

Briefly State Main Points You Wish to Make a Matter of Record:

Signed: _____

SUBMITTAL COVER SHEET

The following information is required and shall accompany all project submittals. Submittals received without this cover sheet shall be deemed incomplete and will not be reviewed.

DATE:	
SUBMITTING CONTRACTOR:	
SUBCONTRACTOR / MANUFACTURER / VENDOR:	
ITEM(S) SUBMITTED:	
SPECIFICATION SECTION:	
SUBMITTAL NUMBER:	

YES	NO	
		Is submitted item in accordance with Contract Requirements?
		Is submittal a substitution?
		If yes, is submittal matrix with supporting documentation included?
		Is submittal complete?
		Does submittal meet Specified Standards?
		Does submittal meet all code requirements?

COMMENTS:

Submitted by:

_____	_____	_____
Signature	Company	Date

SUBMITTAL MATRIX FOR SUBSTITUTION EVALUATION AS APPROVED EQUAL

Specifications	*Product Specified*	*Proposed Equal*
Manufacturer		

The 1st column are items derived from the Specification specific section (doors, windows, etc.). The 2nd column consists of the values for those items for the product specified. The 3rd column is to be entered with the product "equal" data verified with the Manufacturer's literature.

***This comparison must have manufacturer's literature for verification attached!**

READY FOR CLOSEOUT

Contractor shall submit a copy of this document with the completed punchlist, signed and sealed by the Contractor's authorized representative and Notarized, to the Architect indicating that the Work has been completed as required in accordance with the Contract Documents and after which the Contractor shall notify the Architect when re-inspection is requested.

The undersigned certifies that all items of work noted herein and all other required scope of Work have been completed in accordance with Contract Documents and is further certifying that the project is ready for final inspection by the Architect. The undersigned acknowledges providing all required close-out documents, including, but not limited to, all affidavits, warranties and a release of liens, to the Architect.

Items not completed shall be summarized by the Contractor in letter form and attached herewith.

The undersigned hereby certifies that he/she shall pay the Owner for any and all expenses incurred by the Architect due to the Contractor's misrepresentation of completion of punch list items.

Authorized Representative of the Contractor (Print/Type)

Title

Signature Date

THE CONTRACTOR SHALL SEAL THIS PUNCHLIST AS NOTED BELOW:

_____ _____
Contractor's Corporate Seal Notary Seal

Prepared by: _____ Date: _____

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 00 and 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The project includes work at the Mays Landing Campus of the Atlantic Cape Community College. The Contractor will be required to secure permits from the Township of Hamilton Building Department.

B. The project includes the construction of a new Public Safety Building at the Mays Landing Campus, including the demolition of the existing building and preparation of the site. The new building size is approximately 960 sq ft. Work shall include, but not be limited to:

1. Demolition of the existing building
2. Removal of existing concrete slab on grade and foundations
3. Disconnect, removal and protection of utilities in the area of work
4. Site preparation
5. Utility relocation and reconnection
6. New building footings and foundations
7. Building framing
8. Exterior wall and roof assemblies
9. Windows and doors
10. Interior finishes
11. Mechanical systems
12. Plumbing systems
13. Electrical systems
14. Building signage
15. Site restoration and paving

C. This Section includes the following:

1. Work covered by the Contract Documents.
2. Type of the Contract.
3. Work phases.
4. Work under other contracts.
5. Use of premises.
6. Owner's occupancy requirements.
7. Work restrictions.
8. Specification formats and conventions.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification:

NEW PUBLIC SAFETY BUILDING
MAYS LANDING CAMPUS
ARCHITECT'S COMMISSION NO. 20U008

B. Owner:

ATLANTIC CAPE COMMUNITY COLLEGE
5100 BLACK HORSE PIKE
MAYS LANDING, NEW JERSEY 08330

1. Owner's Representative:

Mr. Ed Perkins,
Plant Project Manager
ATLANTIC CAPE COMMUNITY COLLEGE
5100 BLACK HORSE PIKE
MAYS LANDING, NEW JERSEY 08330

Mr. Timothy Edmunds
Director of Projects
ATLANTIC COUNTY IMPROVEMENT AUTHORITY
1333 ATLANTIC AVENUE, SUITE 700
ATLANTIC CITY, NJ 08401

C. Architect:

SPIEZLE ARCHITECTURAL GROUP, Inc.
1395 Yardville-Hamilton Square Road
Hamilton, New Jersey, 08691

1.4 TYPE OF CONTRACT

A. Project will be constructed under a single prime Contract.

1.5 WORK PHASES

A. Project Substantial Completion: Work will commence within Ten (10) Calendar Days after receipt of written "Notice to Proceed" and be substantially completed in accordance with the Contract Documents and Contractor's Construction Schedule for **Substantial Completion** of the entire project within **150 Calendar Days of Issuance of Notice to Proceed**. All time limits stated in the Contract are of the essence.

B. The Project Area will be available to the Contractor to begin work immediately upon the award of the Project.

C. The campus, site and buildings will be open and operational throughout the duration of this contract. Contractor shall have access to the work area during normal working hours, but will be responsible to coordinate with the College's operations. Noisy or potentially disruptive work shall be coordinated with class schedule and events. The Work area must remain protected and safe.

D. Note: the Contractor is strongly encouraged to expedite submittals and ordering of products and long-lead items well in advance of mobilizing to the project site.

E. The Contractor is encouraged to perform disruptive work while classes are not in session, during breaks, etc.

F. The Contractor must notify the Owner seven (7) days in advance of any crane/lifting activities, and no lifting activities can occur while the building is occupied.

1.6 WORK UNDER SEPARATE CONTRACT

A. All work indicated on the drawings and within the specifications, unless noted otherwise, shall be performed under this contract.

1.7 USE OF PREMISES

A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.

B. Use of Site: Limit use of premises to designated work areas within the Contract limits indicated with least amount of disturbance. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations on site to areas where work is required to complete scope of work defined in the Project Manual and Drawings.
2. Owner Occupancy: Allow for Owner occupancy of the areas adjacent to the Project site.
3. Driveways and Entrances: Keep driveways, parking areas, loading areas and entrances serving premises clear and available to Owner, Owner's employees, the public and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

    a. Schedule deliveries to minimize use of driveways and entrances.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
    c. The Contractor is not permitted to use any parking spaces designated for the Owner's staff or visitors without Owner's written permission. Contractor shall review available on-site parking locations prior to submitting its bid.

C. Maintain existing electrical service throughout construction period. Repair damage caused by construction operations. Protect property and persons in the project area during construction period.

D. Removal of non-fixed, movable items will be completed by the Owner prior to the start of construction. Fixed or built-in items shall be removed and/or salvaged, and relocated, by the General Contractor and disconnects by appropriate trades as indicated and/or directed and as required to perform the work.

E. All Personnel shall dress in clothing appropriate to the work they perform. All personnel are to wear shirts, hardhats, safety shoes, glasses, gloves, masks or respirators, noise protection devices, and other protective clothing and equipment as required by OSHA standards.

1.8 OWNER'S OCCUPANCY REQUIREMENTS

A. Full Owner Occupancy: Owner will occupy and use adjacent buildings during entire construction period. Cooperate with Owner during construction operations to minimize conflicts. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits, unless otherwise indicated.

1. Maintain access to existing walkways and other adjacent occupied or used facilities. Do not close or obstruct walkways, driveways or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
2. Provide not less than seven (7) days’ notice to Owner of activities that will affect Owner's operations. Owner reserves the right to stop the work if it interferes with owner’s scheduled occupied activities critical to the owner’s operations.

1.9 WORK RESTRICTIONS

A. On-Site Work Hours: Work may be generally performed inside the existing building during the hours of 7:00 a.m. to 4:00 p.m., Monday through Friday, except otherwise indicated. Care should be taken not to interrupt utilities and be aware of sensitivity to noise that may be disruptive.

1. Special Owner Activities: Special activities may be conducted on site during and after regular owner operation hours and on weekends during the duration of the project. At these times the Contractor may have limited access to the facility. The Owner will provide these dates to the Contractor as soon as they are known.
2. Weekend Hours: Saturday from Subject to approval by the Owner and further subject to ordinances and regulations by local and governing authorities having jurisdiction.
3. Evening Hours: Subject to approval by the Owner and further subject to ordinances and regulations by local and governing authorities having jurisdiction.
4. Hours for Utility Shutdowns: Provide minimum of seven (7) days advance notice to Owner if shutdown of service is necessary during change-over in writing, including anticipated hours for utility shutdown.
5. The Owner has the right to require disruptive work to be discontinued if affecting the students and employee staff.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect and Owner not less than seven (7) days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's and Owner's written permission.

1.10 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat" numbering system.

1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
2. Divisions 00 and 01: Sections in Divisions 00 and 01 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Unit-cost allowances.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.4 SUBMITTALS

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

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

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

1.5 LUMP-SUM AND UNIT-COST ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by the Owner under allowance and shall include freight, and delivery to Project site. Do not include taxes.

B. Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner under allowance shall be included as part of the Contract Sum and not part of the allowance.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 SCHEDULE OF ALLOWANCES

ALLOWANCE No. 1: CONTINGENCY ALLOWANCE. Contractor to include Fifty Thousand Dollars ($50,000.00) in its base bid proposal to address unforeseen conditions that may be encountered during the course of the construction. Prior to commencing with any work to be billed against this allowance, the Contractor must submit pricing information for review and consideration and receive written direction to proceed from the Architect. Any excess allowance not used at substantial completion will be deducted from the contract. The Contractor shall submit tickets and receipts to substantiate costs incurred for allowance work. This is to be identified as an Allowance on the successful contractor’s schedule of values.

ALLOWANCE No. 2: COLD WEATHER ALLOWANCE. Contractor to include TEN Thousand Dollars ($10,000.00) in its base bid proposal to address the potential need for cold weather protective measures during the construction of the project. Prior to commencing with any work to be billed against this allowance, the Contractor must submit a plan and pricing information for review and consideration and receive written direction to proceed from the Architect. Any excess allowance not used at substantial completion will be deducted from the contract. This is to be identified as an Allowance on the successful contractor’s schedule of values.

1. Upon completion of the project, any of the allowance work not used, shall be credited to the Owner.

END OF SECTION 012100

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

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

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

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

2. Bidders are required to provide numerical cost amounts for all alternates listed to reflect the cost associated with the Contract being bid.

3. Bidders are required to provide numerical cost amounts for all alternate bids and unit prices listed to reflect the cost associated with the Contract being bid.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or

deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

AB-1: Provide Ballistics Resistant Material at Control Room 101;
State amount to be "ADDED TO" the base bid to provide all work and cost associated with installing ballistics rated wall liner panels and transaction window at Control Room 101 as indicated on the Contract Documents. The scope of this alternate shall include all necessary preparation, material, labor, accessories, and features for complete and warranted installation of work.

END OF SECTION 012300.

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 012100 "Allowances" for products selected under an allowance.
2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use Form 009315, “Submittal Matrix for Substitution Evaluation as Approved Equal” provided in Project Manual.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.

b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project..
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within (7) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within (15) days of receipt of request, or (7) days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than (15) days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within (30) days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.

c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1. Architect will issue notice via AIA Form G710, Architect’s Supplemental Instructions.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within the time indicated on the Proposal Request, or if not indicated, not to exceed (20) twenty days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Include costs of labor and supervision directly attributable to the change.
    c. Include delivery charges, equipment rentals, and amounts of trade discounts.
    d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

e. Contractor must receive prior written approval from the Owner prior to performing the Work. Any Work completed without prior approval by the Owner will not be paid.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Contractor must receive prior written approval from the Owner prior to performing the Work. Any Work completed without prior approval by the Owner will not be paid.

C. Proposal Request Form: Use AIA Document G709 “Work Changes Proposal Request” for Proposal Requests.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's and Architect’s approval of a Change Order Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701 “Change Order”.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714 “Construction Change Directive”. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive. The Contractor shall be responsible to obtain verification by the Owner’s representative on a daily basis.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 – PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor’s Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

    a. Application for Payment forms with Continuation Sheets.
    b. Submittals Schedule.
    c. Contractor's Construction Schedule.
    d. List of Subcontractors.
    e. List of Products.
    f. List of principal suppliers and fabricators.

2. Submit the Schedule of Values showing a complete breakdown of labor and materials of all components of the work, including that of the Subcontractors, to Architect within (21) twenty one days of the written Notice to Proceed and no later than (7) seven days before the date scheduled for submittal of initial Applications for Payment. The Schedule of Values shall be subject to the satisfaction of the Architect including that of the Subcontractors listed on the “Contractor’s Subcontractor List” before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

    a. Project name and location.
    b. Owner’s Bid Number.
    c. Name of Architect.
    d. Architect's project number.
    e. Contractor's name and address.
    f. Date of submittal.

2. Submit draft of AIA Document G703 Continuation Sheets.
3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Allowances.
    d. Change Orders (numbers) that affect value.
    e. Dollar value.

        1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, as built documents, closeout documents, and demonstration and training in the amount of (2) two percent of the Contract Sum.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site. Include evidence of insurance.

7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Supplementary Conditions. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use AIA Document G702 “Application and Certificate for Payment” and AIA Document G703 Continuation Sheets as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the approved Schedule of Values and Contractor's Construction Schedule. Use approved updated schedules if revisions were made.
2. Include amounts of approved Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit (3) three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. With each Application for Payment submit the following:

1. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment;

a. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item;
b. When an application shows completion of an item, submit final or full waivers;
c. Owner reserves the right to designate which entities involved in the Work must submit waivers;
d. Delete subparagraph below and insert a specific form or special requirements where predetermined. See Evaluations;

e. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner;

2. Affidavits with respect to the absence of claims and liens as to the payment of all employees and Subcontractors;
3. Certified payroll records for the applicable period submitted directly to Owner;
4. Certifications that all Subcontractors have been paid any amount due from any previous progress payment and shall be paid all amounts due from the current progress payment or in a particular case that there exists a valid basis under the terms of the Subcontractor's contract to withhold payment from the Subcontractor (in which case all supporting details shall be provide); and
5. other attachments requested.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Products list.
5. Submittals Schedule (preliminary if not final).
6. List of Contractor's staff assignments.
7. List of Contractor's principal consultants.
8. Copies of building permits.
9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
10. Initial progress report.
11. Report of preconstruction conference.
12. Certificates of insurance and insurance policies.
13. Performance and payment bonds.
14. Data needed to acquire Owner's insurance.
15. Initial settlement survey and damage report if required.

H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
3. The maximum value of the Schedule of Values up to and including Substantial Completion is eighty percent (80%) of the total contract sum, including accepted Alternates.
4. Administrative actions and submittals that shall proceed or coincide with this application includes, but is not limited to:
   a. Occupancy permits and similar approvals.
   b. Warranties, guarantees, and maintenance agreements.
   c. Test records.

d. Maintenance instructions.
e. Final cleaning.
f. Application for reduction of retainage, and consent of surety.
g. Transfer of insurance coverages.
h. List of incomplete work, recognized as exceptions to Architect's Certificate of Substantial Completion.

I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes unless tax exempt, fees, and similar obligations were paid. The Community College is tax exempt.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Certification of paid wages in accordance with New Jersey Prevailing Wage Act.
9. Maintenance Bond.
10. Contractor's "As-Built" drawings.
11. Maintenance Manuals and Instructions.
12. Special written guarantees and warranties in addition to the one-year guarantee covered by the Maintenance Bond. Guarantee shall be signed and sealed by an Officer of the Contracting firm and shall be notarized.
13. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
14. Final, liquidated damages settlement statement.
15. Completed Punchlist signed and sealed by the Contractor's authorized representative and notarized.
16. Removal of temporary facilities and services.
17. Removal of surplus materials, rubbish and similar materials.
18. All attic stock materials have been delivered to the Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Field supervision.
2. Coordination.
3. Submittals.
4. Administrative and supervisory personnel.
5. Project meetings.
6. Requests for Information (RFI's).
7. Cleaning and protection.

B. The contractor and its Subcontractors shall participate in coordination requirements as described herein.

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking information, interpretation or clarification of the Contract Documents.

1.4 FIELD SUPERVISION

A. The Contractor shall have a full time superintendent present on site to supervise its work and that of its Subcontractors. At no time shall the Contractor or its Subcontractors be working on the Project without the Contractor's superintendent present. The Contractor shall submit the name of its Superintendent to the Architect prior to commencement of work.

B. Field Supervisor shall be fluent in the English language to ensure full communications can be achieved during daily operations between Contractor, Architect, and Owner.

1.5 COORDINATION

A. Coordination: Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation. The Contractor shall be responsible for being the supervisor, manager, overseer, coordinator and expediter of its Subcontractors. The Contractor shall have included in its bid a sufficient cost amount to furnish such administrative and supervisory duties.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work and activities is required.

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

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

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

E. Inspection of Conditions: require the installer of each major component to inspect both the substrate and conditions under which work is to be performed. Do no proceed until unsatisfactory conditions have been corrected in an acceptable manner.

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

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

H. Provide attachment and connection devices and methods necessary for securing work. Secure work true to line and level. Allow for expansion.

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

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

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

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

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

1.6 SUBMITTALS

A. The Contractor shall submit copies of the minutes of the weekly Coordination Meetings (013100, 1.8.F) to the Owner and Architect on a weekly basis.

B. Coordination drawings will be prepared in a joint effort by each trade to avoid material and equipment installation interference as well as project delays. The coordination drawings will clearly indicate locations, dimensions, and elevations including, but not limited to, duct work, insulation, mechanical equipment, hot water supply and return piping, fire sprinkler work, electrical fixtures, electrical conduit, structural steel, beams, columns, joist, plumbing piping, plumbing equipment, ceiling grid, penetrations, lintels, etc. Additionally any trade requiring a penetration to be made in wall, floor and or roof shall identify the required opening size and location. The size and type of lintel required for the penetration is also required. Each trade is responsible for laying out their necessary wall, floor or roof penetration.

C. The Contractor will coordinate a meeting between each trade to finalize the coordination review. Upon the final review as to the accuracy of the coordination drawings, the Contractor’s representative who has written authorization from the President of the Company or Corporation to approve and sign-off on the coordination drawings will sign and date the coordination drawings. The General Contractor will then submit copies of the signed and dated coordination drawing to the Architect for review. The signed coordination drawings shall be submitted to the Architect within (30) thirty calendar days from the date of Notice to Proceed. Contractor that fails to furnish completed coordination drawings within the time specified shall be subject to liquidated damages and be financially responsible for removals, repairs, patching, etc. caused by failure to provide coordination drawings at the time needed in coordination with the Contractor’s Construction Schedule.

D. As the work progresses, the Contractor shall familiarize itself with the work to be done by others in so far as it affects its work and shall promptly give such information to others as affects their mutual interests. The Contractor shall notify the Architect of any condition that might prevent the satisfactory completion of their work.

E. The Contractor shall carefully check job space requirements with all trades to make sure that the combined work can be installed in the allotted spaces, chases, etc., with all piping, conduits, ductwork, etc. concealed from view. Coordination drawings shall be the mutual responsibility of all Contractors and Subcontractors involved. Any Contractor or its Subcontractor not coordinating its work with others will be responsible for any additional costs arising from lack of coordination. In the case of conflict between Prime Contractors and subcontractors, the Architect will have the final decision in accordance with the General Conditions of the Contract for Construction. The Contractor that fails to supply the proper sizes and locations shall be financially responsible for consequential corrective work

F. Coordination Drawings: Organize coordination drawings as follows.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:

    a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, electrical, fire suppression and security systems.
    b. Indicate required installation sequences.
    c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Sheet Size: At least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
3. Number of Copies: Submit eight opaque copies of each submittal, or submit PDF copy of each submittal. The Architect will return one copy.
4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
5. Submittals shall include:

    a. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
    b. Plenum Space: Indicate sub-framing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.

c. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
d. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
e. Mechanical and Plumbing Work: Show the following:

1) Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
2) Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
3) Fire-rated enclosures around ductwork.

f. Electrical Work: Show the following:

1) Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
2) Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
3) Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
4) Location of pull boxes and junction boxes, dimensioned from column center lines.

g. Fire-Protection System: Show the following:

1) Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

G. Key Personnel Names: Within (10) ten days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.7 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1. Include special personnel required for coordination of operations with other contractors.

1.8 PROJECT MEETINGS

A. Job Meetings shall be held at the Site, or elsewhere as designated by the Architect or Owner, for each project at least twice per month on a prescribed date and time of each month, or more often, as directed and required by the Architect or Owner.

B. It will be mandatory for the President of the Company or Corporation of the Contractor to be present or have its representative present who has written authorization from the President of the Company or Corporation to approve and sign-off on updated Contractors' Construction Schedule, etc. at every Meeting, unless previously excused by the Architect. Non-attendance of any Job Meetings shall result in a deduction of the Contractor's Contract amount of five hundred ($500.00) dollars per unattended Meeting. A Contractor more than fifteen (15) minutes late to any meeting shall be viewed as not in attendance.

C. General: Architect will Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Architect will inform the Owner and Contractors whose presence is required, of date and time of each meeting. Contractor will inform its Subcontractors, suppliers, participants and others involved whose presence is required of scheduled meeting dates and times.
2. Minutes: Architect will record significant discussions and agreements achieved and distribute the meeting minutes to everyone concerned, including Owner, within (7) seven days of the meeting.

D. Pre-construction Conference

1. Architect shall schedule a Pre-construction Conference and Organizational Meeting at the Project Site or other convenient location no later than fifteen (15) days after execution of the Agreement and prior to commencement of construction activities. The meeting will establish responsibilities and personnel assignments.
2. Attendees: The Owner, the Architect, and their consultants; the Contractor and its superintendent; major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including such topics as:

    a. Tentative construction schedule. Contractor shall bring a draft copy of a Schedule of Construction for review and coordination.
    b. Phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Procedures for processing field decisions and Change Orders.
    f. Procedures for RFIs.
    g. Procedures for testing and inspecting.
    h. Procedures for processing Applications for Payment.
    i. Distribution of the Contract Documents.
    j. Submittal procedures.

k. Preparation of Record Documents.
l. Use of the premises and existing buildings.
m. Work restrictions.
n. Owner's occupancy requirements.
o. Sequence of work to ensure uninterrupted progress of the facility.
p. Responsibility for temporary facilities and controls.
q. Construction waste management and recycling.
r. Parking availability.
s. Office, work, and storage areas.
t. Equipment deliveries and priorities.
u. First aid.
v. Security.
w. Progress cleaning.
x. Working hours.

4. Minutes: Architect will record and distribute meeting minutes.

E. Pre-installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Owner of scheduled meeting dates.
2. Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. The Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility problems.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written recommendations.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.

w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Installer shall record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Installer shall distribute minutes of the meeting to each party present and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date

F. Job Meetings: The Architect or Construction Manager conduct progress meetings at the site or elsewhere as designated by the Architect or Construction Manager for each project at least twice per month on a prescribed date and time of each month, or more often, as directed and required by the Architect. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of Owner, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized, by the president of the company or corporation, to conclude matters relating to the Work.
2. Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.
2) Briefly state points to make a matter of record.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.

12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) RFIs.
16) Status of proposal requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

3. Minutes: Architect will record.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

a. Schedule Updating: The Contractor will revise Contractor's Construction Schedule at least once per month after each job meeting where revisions to the schedule have been made or recognized and when requested by the Architect. Issue revised schedule concurrently with the report of each meeting or within 4 days of Architect's request.

G. Coordination Meetings: The Contractor shall conduct mandatory Project Coordination Meetings at least weekly intervals on a prescribed date and time of week, or more often, as directed and required by the Architect. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and pre-installation conferences.

1. Attendees: In addition to representatives of Owner, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting. The Schedule will be reviewed at each regularly scheduled job meeting or when specifically requested by the Architect.
c. Review present and future needs of each contractor present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Change Orders.
14) Review and establishing needed coordination drawings

3. Reporting: Contractor shall record meeting results and distribute copies to everyone in attendance, Architect, Owner, and to others affected by decisions or actions resulting from each meeting.

1.9 REQUESTS FOR INFORMATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request information at Project meeting, prepare and submit an RFI in the form specified included in Section 009000.

1. RFIs shall originate with the Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
3. If the Architect must prepare “responses to Contractor’s Requests for Information” (RFI’s) where such information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or Project correspondence or documentation the Owner will back-charge the Contractor for all costs associated with the additional Contract Administration Services provided by the Architect.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Architect.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.

9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

    a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Hard-Copy RFIs: in the form specified included in Section 009000.

1. Identify each page of attachments with the RFI number and sequential page number.

D. Software-Generated RFIs: Software-generated form with the same content as indicated above.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow (14) fourteen calendar days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the Contract Time or the Contract Sum.
    e. Requests for interpretation of Architect's actions on submittals.
    f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Contract Modification Procedures.

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within (10) ten days of receipt of the RFI response.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within (7) seven days if Contractor disagrees with response.

G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number prepared using Microsoft Excel or approved equal. Submit log at least monthly, at each job meeting or when specifically requested by the Architect. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.10 PROTECTION OF PERSONS AND PROPERTY

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

B. The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:

1. All employees on the Work and all other persons who may be affected thereby.
2. All the Work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor of any of his Subcontractors of Sub-subcontractors.
3. 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 the Work.

C. The Contractor shall comply with all applicable laws, ordinances, rules, regulations and lawful orders of any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. He shall erect and maintain as required by existing conditions and progress fo the Work, all reasonable safeguards for safety and protection, including posting danger signs and other warning against hazards, promulgating safety regulations and notifying Owners and users of adjacent utilities.

D. When the use of explosives or other hazardous materials or equipment is necessary for the execution of the Work, only after written approval from the Owner, the Contractor shall exercise the utmost care in compliance with State and Local regulations and shall carry on such activities under the supervision of properly qualified personnel.

E. All damage or loss to any property referred to herein caused in whole or in part by the Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them as be liable, shall be remedied by the Contractor.

F. The Contractor shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor’s Superintendent, unless otherwise designated in writing by the Contractor to the Owner.

G. The Contractor shall comply in all respects with the State Construction Safety Code and with applicable federal regulations, and shall see that all Subcontractors comply with the codes and regulations wherever and whenever they are applicable.

H. The Contractor is specifically directed to comply with Section 7 of the Construction Safety Code which requires among other things, first aid kits to be available and the name of the nearest physician and ambulance service to be posted.

I. The Contractor shall notify the Owner immediately if any accident or injury occurring on the project.

J. Where electric or gas welding or cutting work is done above or within ten feet of combustible material, or above a space that may be occupied by persons, interposed shields of incombustible materials shall be used to protect against fire damage or injury due to sparks or hot metal.

K. Tanks supplying gases for gas welding or cutting shall be placed at no greater distance from the Work than is necessary for safety, securely fastened and maintained in an upright position where practicable. Such tanks, when stored for use, should be removed from any combustible material and free from exposures to the ray of the sun or to high temperatures. Remove all tanks from the building at the end of each day.

L. Suitable fire extinguisher equipment shall be maintained near all welding and cutting operations. When operations cease for the noon hour or at the end of the day, the surroundings adjacent to the welding and cutting operations should be thoroughly wet down.

M. A workman equipped with suitable fire extinguishing equipment should be stationed near welding and cutting operations to see that sparks or hot metal do not lodge in floor cracks, or pass through floor or wall openings or lodge in any combustible materials. The workmen shall be kept at the source or work offering special hazards for 30 minutes after the job is completed, to make sure that no smoldering fires have been started.

N. In any emergency affecting the safety of persons or property, the Contractor shall act, at his discretion, to prevent threatened damaged, injury or loss.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's Construction Schedule.
2. Submittals Schedule.
3. Daily construction reports.
4. Material location reports.
5. Field condition reports.
6. Special reports.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

H. Milestone: A key or critical point in time for reference or measurement.

1.4 SUBMITTALS

A. Preliminary Construction Schedule: Submit (3) three copies.

B. Contractor's Construction Schedule: Submit (3) three copies of initial schedule, large enough to show entire schedule for entire construction period.

1. Qualification Data: For scheduling manager.

C. CPM Reports: Concurrent with CPM schedule, submit (3) three copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.

D. Daily Construction Reports: Submit (3) three copies with each monthly application for payment.

E. Material Location Reports: Submit (3) three copies with each monthly application for payment.

F. Submittals Schedule: Submit (3) three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.

6. Schedule dates for purchasing.
7. Schedule dates for installation.
8. Activity or event number.

G. Scheduled date for Architect's and Owner final release or approval.

H. Field Condition Reports: Submit (3) three copies at time of discovery of differing conditions.

I. Special Reports: Submit (3) three copies weekly intervals**.**

1.5 QUALITY ASSURANCE

A. Scheduling Manager Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's and Owner’s request.

B. Pre-scheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review time required for review of submittals and re-submittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for completion and startup procedures.
9. Review and finalize list of construction activities to be included in schedule.
10. Review submittal requirements and procedures.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.

2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, re-submittal, ordering, manufacturing, fabrication, delivery and installation when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
2. Initial Submittal Schedule: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 sixty days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for Notice to Proceed to date of Substantial and Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than (10) ten calendar days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than (60) sixty days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and re-submittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
4. Startup and Testing Time: Include not less than (10) ten calendar days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion and for Township inspections and issuance of a TCO or CO.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Work Restrictions: Show the effect of the following types of items on the schedule including, but not limited to:

a. Coordination with existing construction.
b. Limitations of continued occupancies.
c. Uninterruptible services.
d. Partial occupancy before Substantial Completion.
e. Use of premises restrictions.
f. Seasonal variations.
g. Environmental control.
h. Local ordinances.

2. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

a. Subcontract awards.
b. Submittals.
c. Purchases.
d. Mockups.
e. Fabrication.
f. Sample testing.
g. Deliveries.
h. Installation.
i. Tests and inspections.
j. Adjusting.
k. Curing.
l. Startup and placement into final use and operation.

D. Milestones: Include any milestones in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

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

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor shall, within (15) fifteen calendar days after issuance of a Notice to Proceed, submit a draft Contractor’s Construction Schedule detailing logic, tasks and durations along with a detailed submittal schedule to the Architect.

B. Schedule: The Contractor shall submit a comprehensive, fully developed, Contractor's Construction Schedule. The schedule shall be a comprehensive, fully developed, Contractor‘s Construction Schedule detailing logic, tasks and durations related to all work of the entire

Project. The schedule shall not exceed time limits current under the Contract Documents for substantial completion of (each) phase and that of the Project.

C. Preparation: Indicate each significant construction activity separately. Identify first workday of each week through to completion.

2.4 REPORTS

A. Daily Construction Reports: Contractor shall prepare a daily construction report recording the following information concerning events at Project site: Failure to comply is cause for docking payment.

1. List of subcontractors at Project site.
2. Exact count and E.E.O.C. Classification of personnel at the site.
3. List of separate contractors at Project site.
4. Approximate count of personnel at Project site.
5. Equipment at Project site.
6. Material deliveries.
7. High and low temperatures and general weather conditions.
8. Accidents.
9. Meetings and significant decisions.
10. Unusual events (refer to special reports).
11. Stoppages, delays, shortages, and losses.
12. Meter readings and similar recordings.
13. Emergency procedures.
14. Orders and requests of authorities having jurisdiction.
15. Change Orders received and implemented.
16. Construction Change Directives received and implemented.
17. Services connected and disconnected.
18. Equipment or system tests and startups.
19. Partial Completions and occupancies.
20. Substantial Completions authorized.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for information in Section 009000 Project Forms, Form 009215 Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within weekly of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or

effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Meeting to Review and approve Contractor's Construction Schedule: (14) fourteen calendar days after receipt of the Contractor's Construction Schedule, the Owner, Architect, President of the Company or Corporation, of Contractor, shall meet to review, agree and sign off on the Contractor's Construction in the presence of the Owner, Architect and. Failure of Contractor to sign off on the Contractor's Construction Schedule shall result in the assessment of liquidated damages as outlined in Section 007300 – Supplementary Conditions, article 8.4.1.

B. Contractor's Construction Schedule Updating: At, at least, every 30 calendar days or as often as deemed necessary by the Architect, update schedule to reflect actual construction progress and activities and to recommend changes in the sequencing and scheduling. Issue schedule (1) one week before each regularly scheduled progress meeting. Upon 7 working days of the Architect's request, submit an updated schedule to the Architect.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Actual Completion percentage for each activity.

C. The updated Contractors' Construction Schedule will be reviewed at each Job Meeting. Contractor is required to have a representative present at the Job Meeting with written authorization from the President of the Company or Corporation to review, agree upon and sign-off on any approved and agreed upon changes to the updated Contractors' Construction Schedule. Failure by Contractor to provide timely input in the time required to up[date the schedule shall result in a reduction in Contractor's Contract Amount of FIVE HUNDRED ($500.00) DOLLARS per each occurrence as liquidated damages. In addition, payment to the Contractor may result in the withholding of payments to the Contractor, and in the liability of the Contractor for liquidated damages, for failure of the Project to be completed within the designated time due to the Contractor's failure to cooperate. Contractor shall be responsible for meeting the overall Project's phased completion date(s) and overall substantial completion date.

D. Any acceleration of the Contractor's Construction Schedule shall be agreed upon by Contractor and approved by the Architect in writing.

E. In the absence of a signed change order approving an extension of time, all Contractor Construction Schedule updates must show substantial completion date(s) consistent with the date(s) required in Section 011000 – Summary, paragraph 1.5.C of the Supplementary Conditions. Changes in logistics or duration shall not be made, except for good cause, and shall not result in an extension of the time for substantial completion. In the event certain aspects of

the work fall behind the Contractor's Construction Schedule, the Contractor(s) responsible shall, in coordination, and consultation with all other Contractors, will develop a recovery plan to revise logistics, add manpower resources to reduce durations, expedite procurement or advance start of activities, to get the project back on a schedule that will assure completion in accordance with the substantial completion date.

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

1. Post copies in Project meeting rooms and/or temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.
3. Final completion construction photographs.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting photographic documentation.
2. Section 017700 "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.
3. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
4. Section 024119 "Selective Structure Demolition" for photographic documentation before selective demolition operations commence.

1.3 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building for Architect’s notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation. Architect shall select a minimum of (6) six views to be photographed and included with each Application for Payment.

B. Digital Photographs:

1. Digital Camera: Minimum sensor resolution of 8 megapixels.
2. Format: Minimum resolution of 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
3. Identification: Provide the following information with each image description in file metadata tag:

a. Date photograph was taken.
b. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
c. Unique sequential numerical identifier.

1.4 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner and Architect for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.
2. All photographs require a date and time stamp.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in file name for each image.
2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.

C. Preconstruction Photographs: Before commencement of the installation of temporary facilities and demolition, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.

1. Flag construction limits before taking construction photographs.
2. Take a sufficient number of photographs to show existing conditions adjacent to property before starting the Work.

3. Take a sufficient number of photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Periodic Construction Photographs: Take photographs at regular intervals throughout construction to document regular progress and major milestone, including but not limited to:

1. Commencement of the Work, through completion of subgrade construction.
2. Above-grade structural framing.
3. Exterior building enclosure.
4. Interior Work, through date of Substantial Completion.
5. Roofing activities including existing conditions, tear-off and installation.

E. Submit periodic construction photographs with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

F. Architect-Directed Construction Photographs: From time to time, the Architect may instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.

G. Final Completion Construction Photographs: Take a minimum of twenty (20) color photographs after date of Substantial Completion for submission as project record documents. Architect will inform photographer of desired vantage points.

H. Additional Photographs: Architect may request photographs in addition to periodic photographs specified.

1. In emergency situations, take additional photographs within 24 hours of request.
2. Circumstances that could require additional photographs include, but are not limited to, the following:

a. Special events planned at Project site.
b. Immediate follow-up when on-site events result in construction damage or losses.
c. Photographs to be taken at fabrication locations away from Project site.
d. Substantial Completion of a major phase or component of the Work.
e. Extra record photographs at time of final acceptance.
f. Owner's request for special publicity photographs.

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other Submittals.

B. Administrative Submittals: Refer to other Division 01 Sections, other Specification Sections and Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

1. Permits.
2. Applications for Payment.
3. Performance and Payment Bonds.
4. Insurance Certificates.
5. List of Subcontractors, suppliers, manufacturers, installers.
6. Schedule of Values.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Drawings may be conditionally available from the Architect for Contractor's use in preparing Submittals by a jointly signed indemnity agreement.

1. Contractor and each subcontractor will be required to sign an Indemnification and Hold Harmless Agreement in form provided by the Architect for the use of original electronic information created by the Architect.

2. Electronic files will be provided only for the specific purpose of providing a reference document to the Contractor to be used for backgrounds for the completion by the Contractor of shop drawings only.
3. The Contractor shall agree the electronic information is for reference purposes only and that the Architect provided no warranty of any kind, written or implied, as to the completeness or accuracy of the electronic files.
4. The Contractor shall agree to hold all information contained in the electronic file confidential and protect it against use by others.
5. The Contractor shall be required to indemnify and hold harmless the Architect, its principals, employees, and its consultants in accordance with all terms and conditions listed in the Architect's Indeminification and Hold Harmless Agreement.

B. Coordination: Coordinate preparation and processing of Submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other Submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of Submittals for related parts of the Work so processing will not be delayed because of need to review Submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a Submittal requiring coordination with other Submittals until related Submittals are received.

C. Submittals Schedule: Submit (3) three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first Submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Architect's final release or approval

D. Processing Time: Allow enough time for Submittal review, including time for re-submittals, as follows. Time for review shall commence on Architect's receipt of a fully prepared and complete Submittal. No extension of the Contract Time will be authorized because of failure to transmit Submittals enough in advance of the Work to permit processing, including re-submittals.

1. Initial Review: Allow (14) fourteen calendar days for initial review of each Submittal. Allow additional time if coordination with subsequent Submittals is required. The Architect will advise Contractor when a Submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate Submittal is necessary, process it in same manner as initial submittal.
3. Re-submittal Review: Allow (14) fourteen calendar days calendar for review of each re-submittal.

4. Sequential Review: Where sequential review of Submittals by Architect's consultants, Owner, or other parties is indicated, allow (21) twenty one calendar days for initial review of each Submittal.
5. No extension of contract time will be considered or authorized because of failure to transmit submittals far enough in advance of the work to permit processing.

E. Identification: Place a permanent label or attach Form 009310 Submittal Cover Sheet, included in the Project Manual, with each Submittal for identification.

1. Indicate name of firm or entity that prepared each Submittal on label or title block.
2. Provide a space not less than 6 by 8 inches on label or beside title block to record Contractor's review and approval stamp, markings, date and Contractor's signature with and action taken by the Architect and its Consultants.
3. Include the following information on label for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name of Contractor.
    d. Name of subcontractor.
    e. Name of supplier.
    f. Name of manufacturer.
    g. Submittal number or other unique identifier, including revision identifier.

        1) Submittal number shall include the Specification Section number followed by a decimal point and then a sequential article number (e.g., 06100.01). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., 06100.01.A).

    h. Number and title of appropriate Specification Section.
    i. Other necessary identification.

F. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on Submittals.

G. Additional Copies: Unless additional copies are required for final Submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial Submittal may serve as final Submittal.

1. Submit one copy of Submittal to concurrent reviewer in addition to specified number of copies to Architect.
2. Additional copies submitted for maintenance manuals will be marked with action taken and will be returned.

H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using transmittal form along with a submittal cover sheet, Form 009310 – Submittal Cover Sheet, included in the Project Manual. The Architect will return submittals, without review, received from sources other than the Contractor.

1. Transmittal Form: Provide on form, the following information:

a. Project name:
b. Date.
c. Destination (To:).
d. Source (From:).
e. Specification Section number and title.
f. Transmittal number, numbered consecutively.
g. Submittal and transmittal distribution record.
h. Remarks.
i. Signature of transmitter.

2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous Submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related Submittal.

I. Re-submittals: Make re-submittals in same form and number of copies as initial Submittal.

1. Note date and content of previous Submittal.
2. Note date and content of revision in label or title block. Clearly indicate extent of revision from previous submittal.
3. Resubmit submittals until they are marked "approved" or “approved as noted".

J. Distribution: Furnish copies of final submittals to manufacturers, Subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

K. Use for Construction: Use only final Submittals with mark indicating "approved" or “approved as noted" from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a Schedule of Submittals, arranged in chronological order by dates required by construction schedule to the Architect and Owner. Include time required for review, re-submittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with the Schedule of Values, and Contractor's Construction Schedule.
2. Final Submittal: Submit concurrently with the first complete Submittal of Contractor's Construction Schedule.

B. Failure by Contractor not correcting the scheduled update in the time required shall result in a reduction in the Contractor’s Contract Amount of FIVE HUNDRED ($500.00) per each occurrence as liquidated damages.

2.2 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

B. Product Data: Collect information into a single Submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for Submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each Submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's written recommendations.
b. Manufacturer's written product specifications.
c. Manufacturer's written installation instructions.
d. Standard color charts.
e. Manufacturer's catalog cuts.
f. Wiring diagrams showing factory-installed wiring.
g. Printed performance curves.
h. Operational range diagrams.
i. Mill reports.
j. Standard product operation and maintenance manuals.
k. Compliance with specified referenced standards.
l. Testing by recognized testing agency.
m. Application of testing agency labels and seals.
n. Notation of coordination requirements.

4. Submit Product Data concurrent with Samples.
5. Number of Copies: Submit (5) five copies of Product Data, unless otherwise indicated. Architect will return two copies. Mark up and retain one returned copy as a Project Record Document.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Dimensions.
b. Identification of products.
c. Fabrication and installation drawings.
d. Roughing-in and setting diagrams.
e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
f. Shop work manufacturing instructions.
g. Templates and patterns.
h. Schedules.
i. Design calculations.
j. Compliance with specified standards.

k. Notation of coordination requirements.
l. Notation of dimensions established by field measurement.
m. Relationship to adjoining construction clearly indicated.
n. Seal and signature of professional engineer licensed in the state Project is located if specified.
o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring and who makes the connection.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
3. Number of Copies: Submit five opaque copies of each submittal.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of appropriate Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing

color, texture, and pattern; color range sets; and components used for independent testing and inspection as indicated in the specifications.

a. Number of Samples: Submit three sets of Samples. The Architect will retain one set and the Owner; the remainder will be returned.

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product.
2. Number and name of room or space.
3. Location within room or space.
4. Number of Copies: Submit four copies of product schedule or list, unless otherwise indicated. Architect, will return two copies.

a. Mark up and retain one returned copy as a Project Record Document.

F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation" for Architect’s action.

G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.
4. Number of Copies: Submit (3) three copies of subcontractor list, unless otherwise indicated. Architect, will return (2) two copies.

a. Mark up and retain one returned copy as a Project Record Document.

2.3 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.
2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
3. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."

B. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination".

C. Contractor's Construction Schedule: Comply with requirements specified in Division 00 Section “Supplementary Conditions”, Division 01 Section “Construction Progress Documentation”.

D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person in accordance with Division 01 Section "Project Management and Coordination”. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

J. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on

evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

M. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

N. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

O. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

P. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

R. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

S. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.

3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

T. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

U. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage. Submit insurance in accordance with Division 01 Section 007300 – "Supplementary Conditions".

V. Construction Photographs and Digital Images: Digital Images: Contractor to submit progress photographs showing a minimum of eight (8) different views of work under construction with each monthly application for payment. Photographs are to be taken from the locations, where established by the Architect. Photographs images on CD-ROM and shall bear the date of exposure, name of the Project, Contractor, and Architect. Provide images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of at least 5.0 megapixels, and at an image resolution of not less than 1024 by 768 pixels.

W. Material Safety Data Sheets (MSDSs): Submit information directly to Owner.

2.4 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required Submittals, submit (3) three copies of a statement, signed and sealed by the responsible design professional licensed in the state the Project is located, for each product and system specifically assigned to Contractor to be designed or certified by a licensed professional.

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

2. Submittal will be reviewed by the Architect and Engineer. Once the Submittal is approved, the Contractor shall receive a letter from the Architect stating that the Submittal meets the requirements of the Project. The Contractor shall then be responsible for submitting two signed and sealed copies of the Submittal, with the Architect's Letter, to the local building department, for final review and approval, prior to proceeding with the Work. The Contractor shall provide transmittal copies of this submission to the Owner and the Architect for record purposes.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each Submittal and check for coordination with other work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp, sign and date before submitting to Architect.

B. Approval Stamp: Stamp each Submittal with a uniform, approval stamp. Include Project name and location, Submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that Submittal has been reviewed, checked, and approved for compliance with the Contract Documents along with the Contractor's original signature.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review Submittals that do not bear Contractor's approval stamp, date and signature, and will return them without action.

B. Action Submittals: Architect will review each Submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each Submittal with an action stamp and will mark stamp appropriately to indicate action taken.

C. Informational Submittals: Architect will review each Submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each Submittal to appropriate party.

D. Partial Submittals are not acceptable, will be considered non-responsive, and will be returned without review. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

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

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
4. Specific test and inspection requirements are not specified in this Section.

1.3 DEFINITIONS

A. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.
2. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.

3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

B. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

C. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

D. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

E. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

F. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

G. Certified Special Inspectors: A individual certified in accordance with the administrative provisions of the New Jersey Uniform Construction Code, article 5:23-5.19G Special Inspector Requirements and having successfully completed article 5:23-5.23B Examination Requirements for Special Inspectors, and having received a certificate certifying the individual is a Certified Special Inspector to conduct, supervise and evaluate test or inspections for the following in:

1. Structural Steel and welding special inspector: Structural Steel and welding special inspectors are authorized to carry out field inspections pursuant to section 1704.3 of the IBC International Building, latest adopted version. (New Jersey edition).
2. Concrete special inspector: Concrete special inspectors are authorized to carry out field inspections pursuant to section 1704.4 of the IBC International Building, latest adopted version. (New Jersey edition).
3. Structural Masonry special inspector: Structural Masonry special inspectors are authorized to carry out field inspections pursuant to section 1704.5 of the IBC International Building, latest adopted version. (New Jersey edition).
4. Spray-applied fireproofing special inspector: Spray-applied fireproofing special inspectors are authorized to carry out field inspections pursuant to section 1704.11 of the IBC International Building, latest adopted version. (New Jersey edition).
5. Exterior insulation and finish system (EIFS) special inspector: Exterior insulation and finish system (EIFS) special inspectors are authorized to carry out field inspections pursuant to section 1704.12 of the IBC International Building, latest adopted version. (New Jersey edition).

H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within ten (10) days of Notice to Proceed, and not less than five (5) days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and

forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
3. Owner-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.

10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.8 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified and licensed to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Special Inspector Qualifications: An individual certified in accordance with the administrative provisions of the New Jersey Uniform Construction Code, article 5:23-5.19G Special Inspector Requirements and having successfully completed article 5:23-5.23B Examination Requirements for Special Inspectors, and having received a certificate certifying the individual is a Certified Special Inspector.

I. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

K. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

    a. Provide test specimens representative of proposed products and construction.
    b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

L. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven (7) days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's and Owner’s approval of mockups before starting work, fabrication, or construction.

    a. Allow ten (10) days for initial review and each re-review of each mockup.

6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed, unless otherwise indicated.

1.9 QUALITY CONTROL

A. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
3. Notify testing agencies at least (48) hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

C. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in pre-installation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

D. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified testing agency or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and re-inspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.

3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Sections 017300 "Execution." And 017329 “Cutting and Patching”.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

D. Contractor shall be entirely and solely responsible for the proper care and protection of all materials furnished, and/or work performed under this Contract. He shall take all precautions, which may be necessary to protect such materials or work against damage in any form or theft, until the acceptance of the finished work by Owner.

E. Such precautions shall not relieve said Contractor from making good and replacing any and all work or materials damaged for any cause.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, in Addenda, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued and/or adopted by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. “In Kind”: Identical to the existing item, with all the same features, finishes, options, etc.

H. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

I. “Products”: new material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials and components required for reuse when indicated as such.

J. "Provide": Furnish and install, complete and ready for the intended use.

K. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

L. “Testing Agency”: A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

M. Where the phrases “submit to the Architect” or “report to the Architect” or “consult with the Architect” or phrases of like effect are used, it is intended that such reports or submissions to, and consultations with the Architect shall be made.

N. “Installer”: An installer is the Contractor or another entity engaged by the Contractor, either as an employee, Subcontractor, or Contractor of lower tier, to perform a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

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

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the organizations responsible for the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG Americans with Disabilities Act (ADA)
Architectural Barriers Act (ABA)

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. (The)
ACI	ACI International (American Concrete Institute)
AGC	Associated General Contractors of America (The)
AIA	American Institute of Architects (The)
ANSI	American National Standards Institute
ASTM	ASTM International (American Society for Testing and Materials International)
CSA	CSA International (Formerly: IAS - International Approval Services)
CSI	Construction Specifications Institute (The)
EIA	Electronic Industries Alliance
EJCDC	Engineers Joint Contract Documents Committee
FMG	FM Global (Formerly: FM - Factory Mutual System)
FMRC	Factory Mutual Research (Now FMG)
IAS	International Approval Services (Now CSA International)
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)
ILI	Indiana Limestone Institute of America, Inc.
ISO	International Organization for Standardization
ITS	Intertek
MFMA	Metal Framing Manufacturers Association
MH	Material Handling (Now MHIA)
MHIA	Material Handling Industry of America

NACE	NACE International (National Association of Corrosion Engineers International)
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NETA	InterNational Electrical Testing Association
NFPA	NFPA (National Fire Protection Association)
NRMCA	National Ready Mixed Concrete Association
NSSGA	National Stone, Sand & Gravel Association
OPL	Omega Point Laboratories, Inc. (Acquired by ITS - Intertek)
SWRI	Sealant, Waterproofing, & Restoration Institute
UL	Underwriters Laboratories Inc.

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ICBO	International Conference of Building Officials (See ICC)
ICBO ES	ICBO Evaluation Service, Inc. (See ICC-ES)
ICC	International Code Council

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Specific administrative and procedural minimum actions are specified in this Section, as extensions of provisions in General Conditions and other Contract Documents. These requirements have been included for special purposes as indicated. Nothing in this Section is intended to limit types and amounts of temporary work required, and no omission from this Section will be recognized as an indication by Architect or its Engineers that such temporary activity is not required for successful completion of the Work and compliance with requirements of Contract Documents. Provisions of this Section are applicable to, but not by way of limitation, utility services, construction facilities, security/protection provisions, and support facilities, etc.

C. The types of temporary support facilities required and to be provided includes, but not by way of limitation, security, optional field offices, optional storage sheds, electrical power distribution, lighting, enclosure of work, hoisting facilities, ladders, scaffolds, first aid facilities, private telephones, cleanup facilities, dumpsters and waste disposal services, and similar miscellaneous general services, all as may be reasonably required for proficient performance of the work and accommodation of personnel at the site including Owner's construction forces, Architect’s and Engineers’ personnel. Include moving, relocation and reinstallation as may be required to accommodate construction progress. Discontinue and remove temporary support facilities, and make incidental similar use of permanent work of the project, only when and in manner authorized by the Architect; and, if not otherwise indicated, immediately before time of Substantial Completion. Locate temporary support facilities for convenience of users, and for minimum interference with construction activities.

1.3 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.

B. Electric Power Service: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Water Service: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 QUALITY ASSURANCE

A. General: In addition to compliance with governing regulations and rules/recommendations of franchised utility companies, comply with specific requirements indicated and with applicable local industry standards for construction work (published recommendations by local consensus "building councils").

B. ANSI Standards: Comply with applicable provisions of ANSI A10-Series standards on construction safety.

C. NFPA Code: Comply with NFPA Code 241 "Safeguarding Construction, Alteration and Demolition Operations".

D. Environmental Impact Statement: Comply with provisions of Owner's committed ElS, for development and operation of temporary facilities and construction activities.

E. Conservation: In compliance with Owner's policy on energy/materials conservation, install and operate temporary facilities and perform construction activities in manner which reasonably will be conservative and avoid waste of energy and materials including water.

F. ADA and ICC/ANSI Compliance: Construction for this Project must comply with the current adopted version of the Americans with Disability Act (ADA) and the ICC/ANSI A117.1.

G. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with current adopted version of the NEC.

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

I. Environmental Protection Procedures: provide facilities, establish procedures, and conduct construction activities in a manner which will ensure compliance with Owner’s environmental impact statement and other regulations controlling construction activities at the Project Site. Designate one person, the Construction Superintendent or other, to enforce strict discipline on activities related to generation of wastes, pollution of air, water, soil, general noise, and similar harmful deleterious effects which might violate regulations of reasonably irritate persons at or in vicinity of the Project Site.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. Establish and initiate the use of each temporary facility at time first reasonably required for proper performance of the Work. Terminate use and remove facilities at earliest reasonable time, when no longer needed or when permanent facilities have, with authorized use, replaced the need.

C. Install, operate, maintain and protect temporary facilities in a manner and at locations which will be safe, non-hazardous, sanitary and protective of persons and property, and free of deleterious effects.

D. Installers shall verify clearances of all paths at job site leading to final installation locations, and break down the final product components into component assemblies sized accordingly to negotiate all corners, turns, etc., in the path to its final installation location.

E. Contractors will provide their own extension cords, hoses, etc. as required for their work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials for Temporary Work: Lumber, plywood, gypsum board, insulation, paints, etc. required for temporary work shall comply with corresponding specification sections and applicable codes and regulations of in effect at the Project location by authorities having jurisdiction.

2.2 TEMPORARY FACILITIES

A. Storage and Fabrication Sheds: Contractor shall provide its own storage trailer equipped to accommodate materials and equipment for construction operations. As an alternate, the Owner may be able to make accommodations within the building and project site for storage.

1. Store combustible materials apart from building.

2.3 FIRE PROTECTION PROVISIONS

A. Fire Extinguishers: Provide Fire protection equipment during the entire construction period as required by the authority having jurisdiction of types, sizes, numbers and locations as would be reasonably effective in extinguishing fires during early stages, by personnel at Project site. Portable, UL rated; with class and extinguishing agent as required by locations and classes of

fire exposures. Post warning and quick instructions at each extinguisher location, and instruct personnel at Project site, at time of their first arrival, on proper use of extinguishers and other available facilities at Project site.

2.4 ACCESS PROVSIONS

A. Provide ramps, stairs, ladders and similar temporary access elements as reasonably required to perform the Work and facilitate its inspection during installation. Comply with reasonable requests of governing authorities performing inspections. When permanent stairs are available for access during construction, cover finished surfaces with sufficient protection to ensure freedom from damage and deterioration at time of Substantial Completion.

B. Use of Owner’s elevators is not allowed.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

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

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

B. Sanitary Facilities: Use of owner’s toilet facilities is not allowed. Contractor shall provide, at their own expense, temporary self-contained toilet units with provisions to remove effluent lawfully, wash facilities, and drinking water with cups for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

C. TEMPORARY WATER SERVICE:

1. Water Service: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations. Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

D. TEMPORARY ELECTRIC SERVICE AND LIGHTING

1. Electric Power Service: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations. Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.
2. All necessary labor and materials required for the installation and maintenance of subsequent removal of the temporary distribution system including all fuses and lamps shall be provided by the Contractor.
3. Do not allow, provide or make available for use by any subcontractor, supplier, installer, employee any apparatus, equipment, or cord sets not meeting OSHA requirements.
4. Contractor shall be responsible for obtaining all temporary wiring permits required to facilitate the work; prior to, as well as during construction and adjust the temporary wiring system as needed to accommodate the construction of the Work.
5. Contractor shall maintain temporary light and power until it is no longer required as determined by the Contractor. Contractor shall keep the system in good repair and shall promptly replace burned out, defective, missing or broken lamps. Permanent fixtures mays be used for temporary lighting when used for temporary lighting purposes in permanent fixtures when the Contractor replaces lamps with new, unused lamps immediately prior to the final acceptance of the permanent system.
6. Contractor shall alter and relocate temporary wiring as required when such interfaces with construction as determined by the Contractor. Contractor shall disconnect and completely remove the temporary electrical system or portions thereof in a neat, workman-like manner without cost Owner.
7. Contractor shall not disrupt electrical power whether temporary or permanent during normal working hours. Any switching, splicing, or other work performed by the Contractor, necessitating an interruption of power shall be performed during times when the buildings are not in use by the Owner or their users.
8. Contractor shall provide for temporary site security lighting as required.

E. Telephone Service: Contractor shall use their own cellular telephone service for use by all construction personnel.

3.3 SUPPORT FACILITIES INSTALLATION

A. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Maintain access for emergency and fire-fighting equipment and access to fire hydrants.

B. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

C. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

1. The Contractor shall provide waste-collection containers for use by all construction personnel to deposit all rubbish, debris, boxes, crates, etc. The General Contractor shall

remove and properly dispose of the contents of the waste-collection containers as necessary to keep the progress of the job moving.

2. The Contractor shall maintain the construction areas as clean as the progress of the work will permit.

   a. The Contractor will clean up all its waste materials, rubbish and debris on a daily basis.
   b. The Contractor will place its waste materials, rubbish and debris in the waste-collection containers on a daily basis.
   c. The Contractor will be responsible to keep the construction area, etc. clean and free of debris, materials, etc. at all times during the entire period of construction. If the Contractor does not adhere to this requirement, the Owner will engage a cleaning contractor to thoroughly clean the area and will back charge the General Contractor for all costs involved.

3. Upon Substantial Completion, the Contractor shall completely clean the entire Project. The cleaning shall include, but is not limited to, cleaning of all surfaces, finishes, equipment, fixtures, etc… The building and grounds and surrounding areas shall be left in a condition acceptable to the Owner.

D. Existing Stair Usage: Use of Owner's existing stairs will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Enclosure Fence: Before construction operations begin, furnish and install a temporary enclosure fence where dumpsters, trailers, etc… will be located in a manner that will prevent people and animals from easily entering the construction site except by pedestrian and equipment entrance gates.

C. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

D. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

E. Site Enclosure Fence: at the earliest reasonable date to enclose the project site or work area, or portion thereof determined by the Contractor, with approval by the Owner, to be sufficient to contain the entire construction activity, provide a six foot high chain-link steel fence. Provide

gates for both personnel, trucks, and other construction related equipment and deliveries, with signage, and locks for strict security control.

F. Provide security and protection in coordination with activities and in a manner to achieve 24-hour, 7-day-per-week effectiveness.

G. Temporary Enclosures: Contractor shall provide temporary enclosures for protection of all new and existing construction, exterior work effected by scope of work, in progress and completed, from exposure, foul weather and unsatisfactory ambient conditions, other construction operations, and similar activities.

1. Use fire-retardant treated lumber and plywood. Provide tarpaulins and UL label and flame spread of 15 or less; provide translucent type (nylon reinforced polyethylene) where daylighting of enclosed space would be beneficial for workmanship, and reduce use of temporary lighting.

H. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
2. Construct dustproof partitions with 2 layers of 3-mil (0.07-mm) polyethylene sheet on each side. Cover floor with 2 layers of 3-mil (0.07-mm) polyethylene sheet, extending sheets 18 inches (460 mm) up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant plywood.

    a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches (1219 mm) between doors. Maintain water-dampened foot mats in vestibule.

3. Insulate partitions to provide noise protection to occupied areas.
4. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
5. Protect air-handling equipment.
6. Construct temporary dustproof closures to open ends of ductwork and equipment until such time as systems are ready for use or till substantial completion.
7. Weather strip openings.
8. Provide walk-off mats at each entrance through temporary partition

I. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Prohibit smoking in hazardous fire-exposure and construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Fire Extinguishers: Provide portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

3.5 OPERATION, TERMINATION, AND REMOVAL

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

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

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of the Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Closeout Procedures.

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

1.3 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, purchased for Project. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility**,** except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design" “or approved equal”, including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use Form "Submittal Matrix for Substitution Evaluation As Approved Equal" included in Section 009000 – Project Forms. An example copy is included at the end of this Section.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified material or product is not being provided.
b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
h. Research/evaluation reports evidencing compliance with building code(s) in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
j. Cost information, including a proposal of change, if any, in the Contract Sum.
k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within (14) fourteen days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within (21) twenty one days of receipt of request, or (14) fourteen days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Approval Stamp.

b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

B. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within (14) fourteen days of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within (21) twenty one days of receipt of request, or (14) fourteen days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: Approval Stamp.
b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

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

1. Contractor is responsible for providing products and construction methods compatible with products and construction methods of Owner’s own forces.
2. If a dispute arises over concurrently selectable but incompatible products, Architect will determine which products shall be used.

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

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

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

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms of warranty are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Specification Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures" and as required by specific Sections in the Project Manual.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

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

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
7. Or Approved Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 Article "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
2. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
3. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
4. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
5. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.

6. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.

a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within fifteen (15) days after (the Notice to Proceed). Requests received after that time may be considered or rejected at discretion of Architect.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
11. The substitution shall be accompanied by a written statement signed by all prime contractors effected that the substitution is acceptable, consistent and compatible with their portion of the work and there is no consequential additional cost associated with the substitution.

2.3 COMPARABLE PRODUCTS

A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION

3.1 Example Form 009315 - “Submittal Matrix for Substitution Evaluation as Approved Equal” is attached at the end of this Section.

SUBMITTAL MATRIX FOR EVALUATION OF SUBSTITUTION AS APPROVED EQUALS

Sample

Specifications-Overhead Door	*Product Specified*	*Proposed Equal*
Manufacturer Raynor-Tru-Core	*Raynor Tru-Core*	
Door Sections	*3*	
Gauge	*26 Gauge*	
Insulation	*2-7/8 expanded polystyrene*	
End Stiles	*14 gauge*	
U-value	*.12*	
Finish	*2 Coats baked*	
Weather-stripping	*EPDM*	
Air infiltration	*.81 CFM @ 25 M.P.H*	
Assembly U-Value	*.12*	
Section Joints	*No Air infiltration/ASTM*	
Tracks	*3" Galvanized*	
Angle size	*3-1/2 x 6" x1/8*	
Hardware	*10-5/16 diameter*	
Lock (exterior)	*Tumbler cylinder night latch*	
Lock (interior)	*Dead Bolt*	
Framing	*By other*	
Glazing	*24" x 8" x 5/8 insulated*	
Operator	*RGT-2h 1/2 H.P. 115*	
Trolley rail	*2-1/2 x 2" x 3/16"*	
Limit Switch	*Positive Chain Drive*	

The 1st column are items derived from the Specification specific section (doors, windows, etc.). The 2nd column consists of the values for those items for the product specified. The 3rd column is to be entered with the product "equal" data verified with the Manufacturer's literature. See Section 090000 – PROJECT FORMS for a blank copy to be used when submitting substitutions.

***This comparison must have manufacturer's literature for verification attached!**

END OF SECTION 016000

SECTION 016600 – STORAGE AND HANDLING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 REQUIREMENTS INCLUDED

A. Storage, General.

B. Enclosed Storage.

C. Exterior Storage.

D. Maintenance Storage.

E. Maintenance of Equipment Storage.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 STORAGE, GENERAL

A. Store products, immediately on delivery, in accordance with manufacturer's written instructions, with seals and labels intact and legible. Protect until installed.

B. Arrange storage in a manner to provide access for maintenance of stored items and for inspection.

3.2 ENCLOSED STORAGE

A. Store products, subject to damage by the elements, in substantial weather tight enclosures.

B. Maintain temperature and humidity within ranges stated in manufacturer's written instructions

C. Provide humidity control and ventilation for sensitive products as required by manufacturer's written instructions.

D. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.

3.3 EXTERIOR STORAGE

A. Provide substantial platforms, blocking, or skids, to support fabricated products above ground; slope to provide drainage. Protect products from soiling and staining.

B. For products subject to discoloration or deterioration from exposure to elements, cover with impervious sheet material. Provide ventilation to avoid condensation.

C. Store granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, and protected from adverse conditions to prevent mixing with foreign matter.

D. Provide surface drainage to prevent erosion and ponding of water.

E. Prevent mixing of refuse or chemically injurious materials or liquids.

3.4 MAINTENANCE OF STORAGE

A. Periodically inspect stored products on a scheduled basis.

B. Verify that storage facilities comply with manufacturer’s product storage requirements.

C. Verify that manufacturer’s required environmental conditions are maintained continually.

D. Verify that surfaces of products exposed to the elements are not adversely affected; that any weathering of finishes is acceptable to the manufacturers and under requirements of Contract Documents.

3.5 MAINTENANCE OF EQUIPMENT STORAGE

A. For mechanical and electrical equipment in long-term storage, provide manufacturer’s service package.

B. Service equipment on a regularly scheduled basis, maintaining a log of services; submit as a Record Document.

END OF SECTION 016600

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. General installation of products.
3. Starting and adjusting.
4. Coordination of Owner installed products.
5. Progress cleaning.
6. Protection of installed construction.
7. Correction of the Work.

B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017329 “Cutting and Patching”.
4. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
5. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.
6. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions for Renovation, Alteration and Addition Work: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated are generally known as existing, are not guaranteed and are provided for reference only. Before beginning site work, investigate and verify the existence, location, and depth of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical and telecommunication services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

    a. Description of the Work.
    b. List of detrimental conditions, including substrates.
    c. List of unacceptable installation tolerances.
    d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Submit requests on "Request for Information Form.

E. Should the Contractor encounter elevational, dimensional, subsurface and/or latent conditions at the Site materially differing from those shown on the Plans or indicated in the Specifications, he shall immediately give written notice to the Architect of such conditions before they are disturbed. The Architect will thereupon promptly investigate the conditions and if the Architect finds that they materially differ from those shown on the Plans or indicated in the Specification, he will at once make such changes in the Plans/Specifications as he may find necessary, and any increase or decrease of cost resulting from such changes will be adjusted in the manner provided in the Contract Documents.

3.3 CONSTRUCTION LAYOUT

A. Building Lines and Levels: Locate and lay out control lines and levels for foundations and others required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels.

B. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of (8 feet (2.4 m) eight feet in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Approved Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 NEW WORK AT EXISTING LOCATIONS

A. When a new wall, ceiling, roof or floor assembly is indicated where an existing wall, ceiling, roof or floor assembly exists, the existing shall be removed with associated utilities removed and capped behind the surface of the remaining substrate unless otherwise noted at no additional cost to the Owner.

B. When new finishes are scheduled, indicated or required over existing substrates, the Contractor shall completely remove existing finish materials, such as, but not necessarily limited to,

veneers, coatings, films, oils, sealers, adhesives and other residual materials which are not acceptable substrates for new finishes per new finish manufacturer's written specifications and best industry standards whether specifically indicated or not. Defective substrates which are no longer uniform, dimensionally stable, structurally sound, or otherwise unacceptable for the installation of new finishes, shall be removed and replaced with new material compatible with existing and suitable for the new finish in accordance with material manufacturer's written literature and recognized industry standards. In all cases, consult material manufacturer's literature for new finishes to be installed prior to starting the work.

3.6 OWNER INTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel at pre-installation conferences covering portions of the Work that are to receive Owner's work. Attend pre-installation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

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

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

C. In the event of temporary suspension of Work or during inclement weather, each Prime Contractor will cause his Subcontractors to protect carefully his and their work and materials against damage or injury from the weather. If, in the opinion of the Architect, any work or materials shall have been damaged or injured by reason of failure on the part of a Contractor or any of his Subcontractors to so protect his work, such materials shall be removed and replace at the expense of the responsible Contractor.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Unless directed otherwise, do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or resulting in increased maintenance or decreased operational life or safety. Operating elements include, but are not limited to, the following:

1. Exterior wall construction.
2. Primary operational systems and equipment.
3. Air or smoke barriers.
4. Fire-suppression systems.
5. Mechanical systems piping and ducts.
6. Control systems.
7. Communication systems.
8. Conveying systems.
9. Electrical wiring systems.

C. Miscellaneous Elements: Unless directed otherwise, do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or resulting in increased maintenance

or decreased operational life or safety. Miscellaneous elements include, but are not limited to, the following:

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Equipment supports.
4. Piping, ductwork, vessels, and equipment.
5. Noise- and vibration-control elements and systems.

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

E. Submittals: Approval of procedures for cutting and patching is required before proceeding. Submit a proposal describing procedures. Include the following information, as applicable, in the proposal:

1. List products to be used and firms or entities that will perform Work as well as a detailed description of the Work itself.
2. Indicate dates when cutting and patching will be performed and the anticipated duration of the Work.
3. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
4. If cutting and patching involves additions and modifications to structural elements, submit details and engineering calculations to show how these additions will integrated with the original structure. In all cases indicate any changes in the elevation of the ceiling, or the effect on mechanical and electrical distribution systems.
5. Prior to the cutting and patching of interior architectural elements, building components, or modification of exposed finishes, review the repair and restoration procedures with the Architect prior to the start of the Work.
6. Approval by the Architect to proceed with cutting and patching does not waive the Architect’s or Owner’s right to later require complete removal and replacement of a part of the Work found to be unsatisfactory or otherwise unacceptable.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed, prior to the start of the Work.

B. Before proceeding, meet at the site with the Owner and the Architect and other representatives as may be required prior to cutting and patching. Review areas of potential interference and conflicts. Coordinate procedures and resolve potential conflicts before proceeding.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

B. Once new finishes are installed, contractor shall adequately protect new work from damage (floor protection boards, sheet protection for wall and ceilings, etc…). Contractor shall be fully responsible to repair or replace damaged work in place prior to Owner acceptance.

C. Contractor shall suitably protect adjacent existing construction to remain; including doors and entrances, corridor finishes and other areas of the building used for access to the project site. Contractor shall be fully responsible to repair or replace damaged existing finishes, surfaces and equipment prior to Owner acceptance. Extent of repair or replacement shall extend as necessary so as to leave no evidence of patching.

D. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

E. Concealed utilities, structural elements and hazards: Prior to cutting and patching work, survey and locate utilities, structural elements and hazards using locator/detection equipment. Promptly submit a written report to the Architect describing the nature and extent of any conflicts with the intended function or design of the work. Do not proceed until conflicts are resolved.

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to the fullest extent possible to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
5. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or re-hang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight condition.

D. Certain finishes must be replaced. Repair is not acceptable. Damaged surfaces, exposed to view which cannot be repaired without visible evidence of such repair, chipped or broken glass, scratched transparent finishes, scratched reflective surfaces, ceramic tile, millwork, trim. Where special order finish materials are involved, preorder sufficient quantities necessary for repair prior to the start of the Work.

E. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

3.4 CUTTING AND PATCHING - GENERAL

A. The Contractor shall perform all cutting, drilling, removal, cleaning, servicing, repairing, patching, re-hanging, restoration, etc. that may be required in connection with its work. The Contractor shall be responsible for maintaining all existing warranties.

END OF SECTION 017329

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Salvaging, recycling, disposing nonhazardous demolition materials.

1.3 DEFINITIONS

A. Owner reserves first right of refusal for removal and salvage items. Items indicated for removal and salvage remain the Owner’s property. Remove, clean, and pack items to protect against damage and deliver to Owner’s designated storage area with labels to identify contents of containers.

B. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

C. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

D. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

E. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE

A. Recycle Goals: Owner's goal is to recycle as much nonhazardous demolition and construction waste as reasonably possible.

1.5 SUBMITTALS

A. Waste Management Plan: Submit (3) three copies of plan within (30) thirty days of date established for the Notice to Proceed.

B. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 IMPLEMENTATION

A. General: Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management during the entire duration of the Contract.

1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.

B. Provide separation, handling, transportation, recycling, salvage, and landfilling for all demolition and waste materials.

C. Do not handle, separate, store, salvage, or recycle hazardous materials. Contact Architect if hazardous materials are encountered.

3.2 SALVAGING DEMOLITION WASTE

A. Owner reserves first right of refusal for removal of salvage items. Items indicated to be removed, and salvaged items, remain the Owner’s property. Remove, clean and pack items to protect against damage and deliver to Owner’s designated storage area with labels to identify contents of containers. Demolished materials shall become the Contractor’s property and shall be removed from the site with further disposition at the Contractor’s option.

B. Salvaged Items for Reuse in the Work:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

C. Salvaged Items for Sale and Donation: Not permitted on Project site.

D. Salvaged Items for Owner's Use:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area on-site where designated by Owner.

E. Protect items from damage during transport and storage.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE

A. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of metal studs.
3. Remove and dispose of bolts, nuts, washers, and other rough hardware.

B. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

C. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.

D. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood

E. Carpet (and Pad): Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet (and pad) in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

F. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

G. Plumbing Fixtures: Separate by type and size.

H. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

I. Lighting Fixtures: Separate lamps by type and protect from breakage.

J. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

K. Conduit: Reduce conduit to straight lengths and store by type and size.

L. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

3.4 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Warranties.
3. Final cleaning.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following for each project.

1. In the Application for Payment that coincides with, or first follows, the date of Substantial Completion is paid, show 100% completion for the portion of the Work claimed as Substantially Complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
2. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete (see “Ready for Closeout” Form).
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Complete startup testing of systems, and instruction of the Owner’s operating and maintenance personnel.
8. Submit test/adjust/balance records.
9. Terminate and remove temporary facilities from Project site.
10. Complete final cleaning requirements, including touchup painting.

11. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
12. Advise Owner of pending insurance change over requirements.
13. Make final change over of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of change over in security provisions.

B. Inspection: Submit a written request for inspection for Substantial Completion in accordance with AIA Document A201, Article 9.8 Substantial Completion and as follows:

1. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. After inspection the Architect will prepare the Certificate of Substantial Completion or will notify Contractor of items, either on Contractor's list or additional items identified by Architect that must be completed or corrected before the certificate will be issued.
2. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
3. Additional Re-inspections: If more than two (2) re-inspections are required to be made by the Architect, the Owner shall deduct $500.00 for half a day or $1,000.00 for a full day from the Contract Value for each re-inspection required.
4. Results of completed inspection will form the basis of requirements for Final Completion.
5. Submit completed "Ready for Closeout" Form in Section 009000.

1.4 FINAL COMPLETION/READY FOR CLOSEOUT

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
2. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
3. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
4. Consent of Surety for Final Payment.
5. Submit the final payment request with releases and supporting documentation not previously submitted and accepted.
6. Submit an updated final statement, accounting for final changes to the Contract Sum.
7. Submit a final liquidated damages settlement statement.

B. Inspection: Submit a written request for final inspection/closeout on the form provided in Section 009000 – Project Forms, Form 009500 – Ready for Closeout. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Additional Re-inspections: If more than two (2) re-inspections are required to be made by the Architect, the Owner shall deduct $500.00 for half a day or $1,000.00 for a full day from the Contract Value for each re-inspection required.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit with Request for Substantial Completion Inspection, three copies of punchlist. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties for designated portions of the Work as required by specific Sections of the Project Manual.

B. Disclaimers and Limitations: Manufacturer’s disclaimers and limitations on product warranties do no relieve the Contractor of the Warranty on the Work that incorporates the products. Manufacturer’s disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

E. Warranty Requirements

1. Related Damages and Losses: when correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted work.
2. Reinstatement of Warranty: when Work covered by a warranty has failed and has been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
3. Replacement Cost: upon determination the Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with the requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from its use of the Work through a portion of its anticipated service life.
4. Owner's Recourse: expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights or remedies.

F. Warranty Submittals

1. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.
2. When a special warranty is required to be executed by the Contractor, or the Contract and a Subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Architect for approval prior to final execution.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations. All premises must be broom clean.

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

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep effected paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Remove tools, construction equipment, machinery, and surplus material from Project site.
d. Clean exposed exterior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
e. Sweep concrete floors broom clean in unoccupied spaces.
f. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
g. Wash and wax resilient flooring and other flooring in accordance with manufacturers' recommendations.
h. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
i. Remove labels that are not permanent.
j. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
l. Wipe surfaces of equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Replace parts subject to unusual operating conditions.

n. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
o. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning and dispose of waste materials. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Emergency manuals.
2. Operation manuals for systems, subsystems, and equipment.
3. Maintenance manuals for care and maintenance of products, materials, finishes, systems and equipment.

1.3 SUBMITTALS

A. Submittal: Submit (2) two copies of each manual in final form at least (15) fifteen days before requesting inspection for substantial. Architect will return copy with comments after inspection for substantial completion.

1. Correct or modify each manual to comply with Architect's comments. Submit (3) three copies of each corrected manual within (15) fifteen days of receipt of Architect's comments.

1.4 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.
6. Name and address of Architect.
7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

    a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component for Fire, Flood, Gas leak, Water leak, Power failure, Water outage, System, subsystem, or equipment failure and Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include instructions on stopping, shutdown instructions for each type of emergency, operating instructions for conditions outside normal operating limits, and required sequences for electric or electronic systems.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and equipment descriptions, operating standards, operating procedures, operating logs, wiring and control diagrams, and license requirements.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include start-up, break-in, and control procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; and required sequences for electric or electronic systems.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and inspection procedures, types of cleaning agents, methods of cleaning, schedule for cleaning and maintenance, and repair instructions. Include instructions on methods and material agents known to be detrimental and to be avoided.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including maintenance instructions, drawings and diagrams for maintenance, nomenclature of parts and components, and recommended spare parts for each component part or piece of equipment:

D. Maintenance Procedures: Include test and inspection instructions, troubleshooting guide, disassembly instructions, adjusting instructions**,** and demonstration and training video DVD if available**,** that detail essential maintenance procedures:

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.

F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

1.3 SUBMITTALS

A. Record Drawings and Specifications: Comply with the following:

1. Number of Copies: Submit (1) one set of marked-up Record Prints and Project Specifications.CD containing scan of marked up record prints.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Drawings: Maintain one set of ammonia free blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Revisions to routing of piping and conduits.
    d. Revisions to electrical circuitry.
    e. Actual equipment locations.
    f. Locations of concealed internal utilities.
    g. Changes made by Change Order or Construction Change Directive.
    h. Changes made following Architect's written orders.
    i. Field records for variable and concealed conditions.
    j. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.
3. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect**.**
    e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

A. Maintain one copy of each Product Data Submittal. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark-up record drawings and specifications.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. During the progress of the installation, keep a careful record of all changes and variations in its work from the layout shown on the Contract Drawings in order that the Owner may be provided with a complete set of all Contract Documents showing the work as actually installed.

B. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project. Update the record Contract Documents in the field office in his presence on a weekly basis. In addition to marking the Construction Documents for as-built conditions, submit written reports describing each as-built update.

C. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's and reference during normal working hours.

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video.

1.3 SUBMITTALS

A. Demonstration and Training Schedule: Contractor shall prepare and submit to the Architect a list of all systems and equipment that they will be providing training for. The Schedule shall be submitted prior to the issuance of the Certificate of Substantial Completion. The list shall be generated from the requirements outlined in the project manual, and shall include the following;

1. Spec Section.
2. Name of System or Equipment.
3. Number of Hours of Training to be provided.
4. Miscellaneous Notes or Special Requirements.

B. Instruction Program: Submit (2) two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module, no less than 10 days prior to the anticipated date of the Demonstration and Training. Include learning objective and outline for each training module.

1. At completion of training, submit (2) two complete training manual(s) for Owner's use.

C. Qualification Data: For Instructor.

D. Attendance Record: For each training module, submit list of participants and length of instruction time.

E. Demonstration and Training Video on DVD: Submit (2) two copies within (7) seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

    a. Name of Project.
    b. Name of Architect.
    c. Name of Contractor.
    d. Date of recording.

1.4 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, experienced in operation and maintenance procedures and training. Credentials shall be presented at the time of demonstration and a copy of the credentials and contact information included with the Demonstration DVD.

1.5 COORDINATION

A. The Demonstration and Training Schedule shall be submitted to the Architect and Owner no less than 14 calendar days prior to the first scheduled demonstration and training event.

B. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

C. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

D. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

E. Timeline: The general time line and schedule regarding Demonstration and Training shall be as follows:
    1. Submit Operations and Maintenance Manuals to the Architect for Review
    2. Architect reviews and returns Operations and Maintenance Manuals to the Contractor
    3. Contractor submits Demonstration and Training Schedule to the Architect (14 days minimum prior to the commencement of training).
    4. Contractor submits Instruction Program(s) (10 days minimum prior to the commencement of training).
    5. Owner confirms availability for proposed training dates and times, and schedules a location for training to be held (3 days minimum prior to the commencement of training).

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment, including, but not limited to, the following types of systems as provided:

1. Equipment, including projection screens, laboratory fume hoods.
2. Fire-protection systems, including fire alarm, and fire-extinguishing systems.
3. Intrusion detection systems.
4. Laboratory equipment, including laboratory air, gas and vacuum equipment and piping.
5. Heat generation, including boilers, pumps, and water distribution piping.
6. Plumbing systems, including fixtures, pumps, and water distribution piping.
7. Refrigeration systems, including chillers, cooling towers, condensers, pumps, and distribution piping.
8. HVAC systems, including air-handling equipment, air distribution systems, and terminal equipment and devices.
9. HVAC instrumentation and controls.
10. Electrical service and distribution, including transformers, switchboards, panelboards, uninterruptible power supplies, and motor controls.
11. Lighting equipment and controls.
12. Communication systems, including intercommunication, voice and data.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

   a. System, subsystem, and equipment descriptions.
   b. Performance and design criteria if Contractor is delegated design responsibility.
   c. Operating standards.
   d. Regulatory requirements.
   e. Equipment function.
   f. Operating characteristics.
   g. Limiting conditions.
   h. Performance curves.

2. Documentation: Review the following items in detail:

   a. Emergency manuals.
   b. Operations manuals.
   c. Maintenance manuals.
   d. Project Record Documents.
   e. Identification systems.
   f. Warranties and bonds.
   g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.
    k. Seasonal and weekend operating instructions.
    l. Required sequences for electric or electronic systems.
    m. Special operating instructions and procedures.

5. Adjustments: Include the following:

    a. Alignments.
    b. Checking adjustments.
    c. Noise and vibration adjustments.
    d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

    a. Diagnostic instructions.
    b. Test and inspection procedures.

7. Maintenance: Include the following:

    a. Inspection procedures.
    b. Types of cleaning agents to be used and methods of cleaning.
    c. List of cleaning agents and methods of cleaning detrimental to product.
    d. Procedures for routine cleaning
    e. Procedures for preventive maintenance.
    f. Procedures for routine maintenance.
    g. Instruction on use of special tools.
    h. Instructions on methods and material agents known to be detrimental and to be avoided.

8. Repairs: Include the following:

    a. Diagnosis instructions.
    b. Repair instructions.
    c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
    d. Instructions for identifying parts and components.
    e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

3.2 SCHEDULING

A. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

    1. Schedule training with Owner, through Architect, in accordance with requirements outlined in Section 1 above.

B. The Owner shall not be liable for any additional costs related to rescheduling of training, provided that they gave a minimum of 48 hours' notice to the Contractor of the need to reschedule a Demonstration and Training Event.

C. Should the Contractor fail to be prepared or show up on the agreed to date and time for training, this shall result in a reduction in the Contractor's Contract Amount of FIVE HUNDRED ($500.00) DOLLARS per each occurrence as liquidated damages.

3.3 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

    1. Schedule training with Owner, with at least (7) seven days' advance notice.

3.4 DEMONSTRATION AND TRAINING VIDEO ON DVD

A. General: Engage a qualified photographer to record demonstration and training videos. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

B. Video Format: Provide high-quality DVD color.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.

END OF SECTION 017900

SECTION 023000-SUBSURFACE INVESTIGATION & TEST PITS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Excavation work under this Contract is unclassified and includes (without limitation thereto) excavation and removal of all soil, shale, rock, boulders, existing foundations, underground structures and utilities, fill and every kind of subsurface conditions encountered within the Contract limit lines. No extra or additional compensation for excavation will be paid under this Contract for unclassified excavation work included on the base bid.

B. Existing utility information shown on the drawings has been collected from various sources and is not guaranteed as to accuracy or completeness. The Contractor shall verify all information to his satisfaction prior to excavation. Where existing utilities are to be crossed by proposed constructions, test pits shall be dug by the Contractor, at no additional cost to the Owner, and shall be dug prior to construction to ascertain existing inverts, materials, and sizes. Test pit information shall be provided to the Engineer prior to construction to permit adjustments as required to avoid conflicts. The Contractor shall notify the Engineer immediately if any field conditions encountered differ materially from those represented on the drawings. Such conditions could render the designs on the drawings inappropriate or ineffective.

1.2 ADDITIONAL INFORMATION

A. The Contractor shall visit the site and acquaint himself with all existing conditions prior to submittal of bid. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions, but such subsurface investigations shall be performed only under time schedules and arrangements approved in advance by the Owner.

1.3 QUALITY ASSURANCE

A. A Soil Engineer shall be retained by the Contractor to provide testing and continuous inspection of work in connection with excavating, filling, compacting, and grading. Re-adjust all work performed which does not meet technical or design requirements, but make no deviations from the Contract Documents without specific and written approval of the Architect. Soil Engineer shall be licensed in the State of New Jersey as a Professional Engineer.

END OF SECTION 023000

SECTION 023201 – GEOTECHNICAL DATA

THIS DOCUMENT IS MADE AVAILABLE FOR CONVENIENCE OF THE CONTRACTOR.

"GEOTECHNICAL ENGINEERING REPORT – PROPOSED SECURITY BUILDING"

THE REPORT WAS PREPARED BY:

MASER CONSULTING, P.A.
5439 Harding Highway
Mays Landing, New Jersey 08330

Eduardo Freire, PE
N.J. LICENSE NUMBER24GE04339100

20 TOTAL PAGES

DATA ON INDICATED SUBSURFACE CONDITIONS ARE NOT INTENDED AS REPRESENTATIONS OR WARRANTIES OF ACCURACY OR CONTINUITY OF SUCH CONDITIONS BETWEEN AND SURROUNDING SOIL BORINGS. IT IS EXPRESSLY UNDERSTOOD THAT THE OWNER, ARCHITECT AND ITS ENGINEERS WILL NOT BE RESPONSIBLE FOR INTERPRETATIONS OR CONCLUSIONS DRAWN THERE FROM BY THE CONTRACTOR.

Engineers Planners Surveyors Landscape Architects Environmental Scientists

MASER CONSULTING P. A.

Geotechnical Engineering Report

Proposed Security Building

Atlantic Cape Community College
5100 Black Horse Pike
Mays Landing, Atlantic County, New Jersey

May 13, 2020

Prepared For

Atlantic Cape Community College
Mr. Edward Perkins
5100 Black Horse Pike
Mays Landing, New Jersey 08330

Prepared By

Maser Consulting P.A.
5439 Harding Highway
Mays Landing, NJ 08330
609.625.1700

MC Project No. 20C002055E

Engineers
Planners
Surveyors
Landscape Architects
Environmental Scientists

5439 Harding Highway
Mays Landing, NJ 08330
T: 800.258.3787
T: 609.625.1700
F: 609.625.1798
www.maserconsulting.com

May 13, 2020

Atlantic Cape Community College
5100 Black Horse Pike
Mays Landing, New Jersey 08330

Attn: Mr. Edward Perkins

Re: Geotechnical Engineering Report
Proposed Security Building
Atlantic Cape Community College
5100 Black Horse Pike
Mays Landing, New Jersey

MC Project No. 20C002055E

This report is submitted as per our agreement. It includes our findings, conclusions and recommendations related to the design and construction of foundations for the proposed security building.

We understand that the project includes the construction of a new single (1)-story security building with a footprint area of approximately one-thousand (1,000) square feet to be located generally in the same footprint as the existing single (1)-story security building, as part of the Atlantic Cape Community College (ACCC) campus located at 5100 Black Horse Pike in Mays Landing, New Jersey.

EXPLORATIONS

Published Information

A desk study was completed to ascertain mapped soils and geologic formations within the site boundaries. The United States Department of Agriculture (USDA) – Natural Resources Conservation Service (NRCS) soil mapping and the Rutgers Engineering Soil Survey of New Jersey (No. 18) for Atlantic County were reviewed for soil properties. The Bedrock Geologic Map of Central and Southern New Jersey (Owens, James P., et. al., 1999, I-2540-B) was reviewed for geologic properties.

Test Borings

Two (2) test borings (B-1 & B-2) were completed on April 24, 2020 using split spoon sampling (ASTM D1586) with hollow stem auger drilling utilizing a truck mounted drill rig owned and operated by Soil Borings Drilling, LLC. The test boring locations were determined in the field by the client and were performed directly outboard of the existing security building, generally within the footprint of the proposed security building. A location plan depicting the test boring

locations relative to the existing site features, as well as, test boring logs depicting the subsurface conditions found at each discrete test boring location, are attached to this report.

Geotechnical Laboratory Testing

Laboratory soil tests were performed on select soil samples collected from the completed test borings to assist with the identification of physical soil parameters and evaluation of engineering properties. The results are presented in the *"Findings"* section of this report.

FINDINGS

Location and Site Features

The site of the proposed security building is located along the western extent of the ACCC campus. The site is currently occupied by the existing security building and surrounding asphalt paved parking lot. No visible and apparent structural distress was observed from a cursory and non-intrusive exterior inspection of the existing security building. The existing site grades in the immediate vicinity of the proposed security building are relatively level.

The site is generally bounded to the north by undeveloped wooded wetlands with asphalt paved roads leading to the Black Horse Pike (US Route 322), to the south by asphalt paved roads and parking areas followed by undeveloped wooded wetlands, to the east by the existing Atlantic Cape Community College campus containing multi-story buildings, and to the west by an asphalt paved parking area and undeveloped wooded wetlands.

Soil Mapping

Review of the published information revealed the site to be underlain by Psamments (PssA), Berryland Sand (BerAr), and AM-24 (ge) soils. The Psamments indicates the area consists of buildings, pavement and other impervious surfaces over fill or disturbed original soil material. These soils are often modified by filling or leveling operations associated with urban development and are often covered by varying depths of fill materials to raise low lying areas. The underlying natural soils are derived from unconsolidated alluvial and fluviomarine deposits consisting of stratified clayey silt and sand with intermixed gravel. A distinct silt or clayey silt layer is sometimes encountered at approximately five (5) to seven (7) feet below the ground surface. Soil colors tend to be red-brown to dull red or gray. These soils tend to have good to excellent drainage characteristics depending on the elevation of the landform and variable soil composition.

Geologic Mapping

Available geologic literature indicates the site is located entirely within the Outer Atlantic Coastal Plain Physiographic Province of New Jersey. The site is completely underlain at depth by the Cohansey Formation (Tch) (middle Miocene Epoch, Serravallian Age) consisting of massive to cross bedded gravelly fine to coarse sand with discrete lenses of clay and silt. The formation tends to be gray to medium gray with zones of woody clay.

Subsurface

As a result of the information gathered during the desk study, the completed test borings on the site and laboratory testing performed on representative samples, the following generalized subsurface profile can be derived:

Stratum	Depth Range Below Existing Site Grade (ft)	Average Stratum Thickness (ft)	Subgrade Description	Condition
A	0.0 – 0.3	0.3	**ASPHALT** (3")	-
PF	0.3 – 4.0	3.7	Poorly graded **SAND** with silt/clay (SP-SM/SC) / Silty/Clayey **SAND** (SM/SC) (POSSIBLE FILL) COLORS: Tan, orange, brown	Loose to Medium Dense
1A	4.0/24.0 – 8.0/25.0	6.3	Clayey **SAND** (SC) / Silty **SAND** (SM) COLORS: Light gray, tan, orange, brown, dark gray	Very Loose to Medium Dense
1B	8.0/21.5 – 10.0/25.0	5.7	Sandy **CLAY** (CL) / **CLAY** with sand (CL) COLORS: Orange, tan, light gray	Soft to Stiff

Maximum Depth of Exploration for B-1 & B-2 = 25.0 feet.
Note 1: Trace organics were observed in samples S-3B (5' – 6') & S-4A (6' – 7'6") in test boring B-1.
Note 2: Stratum 1B was generally observed interbedded within Stratum 1A, significantly in test boring B-2.

Groundwater

Groundwater was encountered in the test borings at depths ranging from approximately five (5) to six (6) feet below the existing grades. The groundwater levels were measured at the time of the explorations and do not consider seasonal fluctuations in the groundwater table. Groundwater levels can be expected to fluctuate throughout the year. If precise groundwater levels are required, it is recommended that a monitoring well be installed and monitored for several months.

Geotechnical Laboratory Testing Results

The following table summarizes the geotechnical laboratory test results:

Test Boring No.	Sample No.	Depth (ft)	Particle Size Analysis (ASTM D422)		Atterberg Limits (ASTM D4318)			Water Content (%) (ASTM D2216)	Organic Content (%) (ASTM D2974)
			Plate No.*	USCS	Liquid Limit	Plastic Limit	Plasticity Index		
B-1	S-2	2 – 4	PSA-1	SM/SC	-	-	-	-	-
	S-3B	5 – 6		SM	Non-Plastic			24.7	2.7
	S-4B	7.5 – 8		SC	27	18	9	18.8	-
B-2	S-1A	0.5 – 1.5	PSA-2	SM/SC	-	-	-	-	-
	S-3	4 – 6		SM/SC	-	-	-	-	-
	S-5	8 – 10		CL	34	18	16	15.4	-

**See attached Plates; Unified Soil Classification System (USCS) – Group Symbol.*

ANALYSIS AND DESIGN CONSIDERATIONS

The following were considered in developing the geotechnical conclusions and design recommendations:

1. Plans depicting existing and proposed site features were not provided for review.
2. Our understanding is that the proposed security building is to be constructed generally within the footprint of the existing security building, will have a footprint area of approximately one-thousand (1,000) square feet, and will be supported by a shallow foundation with a slab-on-grade. The proposed security building will be slightly wider and longer than the existing building (extending to the north and east by approximately six (6) feet). The existing security building contains a crawlspace.
3. Structural loads for the proposed security building were not provided for review.
4. Finished site grades will generally match existing site grades, with cuts and fills no greater than one (1) to two (2) feet. Existing and proposed grading plans were not provided for review.
5. The existing structure, structural elements, etc. will be demolished and removed in their entirety from within the proposed security building footprint area and extending a minimum of five (5) feet outboard of the proposed building perimeters.
6. Any existing underground utilities within the proposed security building footprint area and extending a minimum of five (5) feet outboard of the

proposed building perimeters, will be removed, relocated or abandoned (grouted in-place).

7. Any prior historical use of the site beyond the observed existing site development was not provided for review. Site historical background review and its geotechnical impact, if any, is not included in our scope of work.
8. This report does not address environmental issues, stormwater management and pavement recommendations.
9. The design and construction shall be completed in accordance with the appropriate codes.

COMMENTS AND CONCLUSIONS

Desk Study

The desk study indicates the site is underlain by surficial man-placed fill and unconsolidated stratified clayey silt and sand overlying the Cohansey Formation, generally consistent with the test boring exploration results. The depth of any in-place fill is difficult to discern without historical grading plans due to similarities in appearance between the near surface soils and the natural soils of the area, however the top four (4) feet of the soil profile appears to be possible fill.

Subsurface Conditions

The subsurface conditions near the location of the proposed security building to a depth of down to approximately twenty-five (25) feet below the existing site grades consist of approximately three (3) inches of surficial asphalt (Stratum A) overlying an average of approximately three-and-seven-tenths (3.7) feet of possible fill consisting of loose to medium dense sand with variable amounts of silt and clay (Stratum PF). Stratum PF is overlying very loose to medium dense sand with variable amounts of silt and clay (Stratum 1A) interbedded with soft to stiff clay with variable amounts of sand (Stratum 1B) extending to the test boring termination depth.

Proposed Security Building Foundations

The subgrade soil observed at the test boring locations (performed directly outboard of the existing security building) is relatively weak and compressible, which makes it susceptible to excessive total and differential settlement under applied loading conditions from a traditional shallow foundation system. We understand that the existing security building was constructed circa 1985 (approximately 35 years ago) and does not exhibit signs of structural distress. The subgrade soil below the existing security building has likely been improved during previous construction and subsequent preloading from the existing structure. However, this will not be the case for subgrade soil extending outboard of the existing security building, as observed in the test borings, to be encompassed in the new building footprint area. There is a potential for differential settlement between foundations placed within the previous security building footprint and the proposed security building footprint. Based on these findings, we recommend ground

improvements, a relatively low maximum allowable soil bearing capacity, limited foundation sizes and stiffening the foundation system, as discussed in detail below.

The result of our evaluation and analysis indicates that the in-place subgrade (Strata PF and 1A), after performing ground improvements, is suitable for the direct support of a shallow foundation system consisting of continuous and isolated spread footings, the slab-on-grade and any compacted structural fill needed to achieve finished bearing levels. Subsequent to the demolition and removal of existing structural elements including surficial asphalt, and the removal of any underground utilities, unsuitable fill, buried debris and organic material, ground improvements should consist of heavy compaction (proof-rolling) of the proposed security building footprint area and extending a minimum of five (5) feet outboard of the proposed perimeters, and compacting the building spread footing bearing levels to a visually stable condition in order to reduce post construction settlement and improve soil strength. Specific attention should be made to the northern and eastern portions of the proposed security building during ground improvement operations to densify the loose subgrade soil not contained within footprint area of the previous security building.

The shallow foundation bearing level should be on compacted in-place soil of Strata PF, 1A or compacted structural fill at least two-and one-half (2.5) feet below the final exterior grades for frost heave protection. A maximum allowable soil bearing capacity of one-thousand-five-hundred (1,500) pounds per square foot (psf) can be utilized for design of the shallow foundations provided the site and subgrades are prepared in accordance with the recommendations described herein. Continuous and isolated spread footings should have minimum widths of two (2) and three (3) feet, respectively, even if geometry produces a bearing pressure less than that recommended. Continuous and isolated spread footings should have maximum widths of two (2) and three (3) feet, respectively, to minimize stresses imparted on underlying weaker subgrade soil and thereby limit post construction settlement. Furthermore, we recommend that the spread footings be reinforced, and the entire masonry foundation walls be reinforced and grouted solid if constructed using CMU or reinforced if constructed using cast-in-place concrete to stiffen the foundation and minimize any differential settlement impact. A modulus of subgrade reaction (k) of one-hundred-fifty (150) pounds per square inch per inch (pci) can be utilized for slab thickness and reinforcement design, provided the site and slab subgrades are prepared in accordance with the recommendations described herein.

It is our opinion that the above recommended ground improvement option, limiting allowable soil bearing capacity, limiting foundation sizes and stiffening the foundation system is the most economical solution for the project. However, upon review of the allowable soil bearing capacity and maximum foundation sizes by the project structural engineer, should a higher bearing capacity be desired for the support of the proposed security building, we can provide additional soil removal and replacement or ground improvement options, upon request.

Groundwater Considerations

For groundwater control and design considerations, use a depth to groundwater of four (4) feet below the existing site grades. Static groundwater levels are anticipated to be below the foundation excavations. However, perched water conditions may be encountered during footing

and slab preparation due to the presence of fine-grained soil (silt/clay). Any perched water or run-off should immediately be removed from excavations utilizing local sumps and pumps and positive drainage techniques, as necessary, during subgrade preparation. A leveling course of up to twelve (12) inches of compacted clean ¾" crushed stone, NJDOT No. 57 Coarse Aggregate (901.03) or equivalent may be placed and compacted within the bottom of the shallow foundation and slab-on-grade excavations to help maintain subgrade stability and control groundwater conditions, as necessary.

Site Preparation and Earthwork Considerations

The existing security building structure, structural elements, concrete and asphalt must be demolished and removed in their entirety from within the footprint area of the proposed security building and extending a minimum of five (5) feet outboard of the proposed perimeters, including removing, relocating, or abandoning (grouting in-place) any existing underground utilities. Compacted structural fill should be used to backfill any excavations within the footprint of the proposed security building and a extending a minimum of five (5) feet outboard of the proposed perimeters.

Any organic material including topsoil, vegetation, roots (>¼" diameter), root balls and stumps must be removed in its entirety from beneath the proposed security building footprint area. Organic material was observed in test boring B-1 at a depth of approximately five (5) to seven-and-one-half (7.5) feet below the existing site grades. A contingency should be made for removal of additional organic material including topsoil, vegetation, roots (>¼" diameter), root balls and stumps and soils improvement, as needed during site and subgrade preparation, and earthwork operations.

Unsuitable (deleterious) fill and buried debris were not encountered at the test boring locations; however, the location of the site within a developed area and unknown prior historical use may indicate that during construction of the proposed security building, some areas of unsuitable (deleterious) fill or buried debris material may be encountered. If any unsuitable (deleterious) fill or buried debris is encountered within the proposed security building footprint areas, it should be removed in its entirety and backfilled with compacted structural fill.

The near surface subgrade profile (Strata PF and 1A) generally consists of very loose to medium dense sand with significant amounts of fine-grained soil (silt/clay). The proposed security building footprint area and extending a minimum of five (5) feet outboard of the proposed perimeters, should be densified by heavy compaction (proof-rolling) following site stripping/clearing and prior to any bulk fill placement to achieve a uniform bearing surface. Furthermore, the foundation and slab-on-grade bearing levels should be densified and compacted to a visually stable condition with a suitable compactor immediately prior to placement of any subbase, reinforcement and concrete. Specific attention should be made to the northern and eastern portions of the proposed security building during ground improvement operations to densify the loose subgrade soil not contained within footprint area of the previous security building. We recommend that a contingency for soil removal be provided in the contract in case the loose subgrade soil is unable to be stabilized during construction.

Backfilling against foundations, foundation walls and under load bearing structures, such as but not limited to foundations and slabs, should be performed using compacted structural fill. Based on visual identification and laboratory testing, the predominantly granular in-place soil of Strata PF and 1A that are free of contamination, organics, debris, silt/clay layers and particles larger than three (3) inches in size, is suitable for re-use as compacted structural fill. However, it may be advisable to use imported structural fill to backfill any excavations and establish the finished grades beneath the proposed security building as it is anticipated that it may be difficult and time-consuming to adequately moisture-condition the excavated in-place soil to enable re-use as compacted structural fill. The fine-grained soil of Stratum 1B is not suitable for use as compacted structural fill and should be stockpiled separately for use within non-structural (landscaped) areas only. Specifications for imported structural fill are presented in the "*Recommendations*" section of this report.

RECOMMENDATIONS

The following recommendations are offered and should be performed in the order presented:

Site Preparation and Earthwork

1. Site preparation and earthwork should be performed during dry and favorable weather conditions.
2. Surface water runoff controls should be implemented to divert surface water runoff from the proposed security building footprint area and foundation excavations. Control measures should include diversion berms and/or trenches and sump pumps.
3. Use a depth to groundwater of four (4) feet for groundwater control and design considerations. Groundwater levels are anticipated to be below the foundation excavation level and full-scale site dewatering is not anticipated to be required. However, runoff may occur, and perched water conditions may be encountered. Any water should immediately be removed from excavations by using local sump pumps and positive drainage techniques. Groundwater discharge permits may be required and need to meet local requirements.
4. Completely demolish and remove existing structural elements in their entirety from within the proposed security building footprint areas and extending a minimum of five (5) feet outboard of the proposed perimeters, including removing, relocating, or abandoning (grouting in-place) any existing underground utilities. Any backfilling should be performed with compacted structural fill.
5. Remove any vegetation and topsoil, unsuitable (deleterious) fill, buried debris and extended organic material in their entirety from within the proposed security building footprint areas and extending a minimum of five (5) feet outboard of the proposed perimeters. Use compacted structural fill to backfill any excavations.

6. Subsequent to performing items 4 and 5 and prior to placing any site fill or excavating spread footings, heavy compact (proof-roll) the excavated level with a minimum of six (6) passes of a minimum ten (10) ton static weight compactor operated in vibratory mode. Three (3) passes are to be performed in one direction with the subsequent three (3) passes performed perpendicular to the direction of the first three (3) passes. The compactor should be operated in static mode if the groundwater table is within two (2) feet of the working level. Any frozen ground present at the excavated level should be removed in its entirety or allowed to completely thaw prior to proof-rolling. Any soft area detected during proof-rolling should be removed and the excavation backfilled with compacted structural fill. Specific attention should be made to the northern and eastern portions of the proposed security building during ground improvement operations to densify the loose subgrade soil not contained within footprint area of the previous security building.
7. Subsequent to the heavy compaction (proof-rolling) operation (item 6), use compacted structural fill to establish the finished grades, if required.
8. Due to excavation disturbance and subgrade conditions, prior to placement of reinforcement and concrete, the excavated spread footing soil bearing levels should be densified and compacted to a visually stable condition with a minimum of four (4) passes of a walk behind vibratory compactor, rammer (jumping jack) or similar equipment. Plate vibratory tampers are not suitable. Any soft area detected during compaction should be removed and the excavation backfilled with compacted structural fill.
9. Due to construction disturbance and under slab utility construction, prior to placement of any subbase, reinforcement and concrete, the subgrade beneath the concrete slab-on-grade should be densified and compacted to a visually stable condition with a minimum of four (4) passes of a walk behind vibratory compactor, rammer (jumping jack) or similar equipment. Plate vibratory tampers are not suitable. Any soft area detected during compaction should be removed and the excavation backfilled with compacted structural fill.
10. Foundations and slabs should not be constructed on frozen ground. Any frozen ground beneath the foundations or slabs should be removed in its entirety and backfilled with compacted structural fill or allowed to completely thaw prior to the placement of and subbase, reinforcement and concrete.
11. Backfilling against foundations, foundation walls and under load bearing structures such as but not limited to foundations and slabs should be performed using compacted structural fill.
12. Based on visual identification and laboratory testing, the predominantly granular in-place soil of Strata PF and 1A that are free of contamination, topsoil, organics, debris, silt/clay layers and particles larger than three (3) inches in size, is suitable for use as compacted structural fill. **However, due to the anticipated difficulty in adequately moisture conditioning the in-place soil as required to facilitate controlled fill placement, it may be advisable to use imported structural fill for backfilling and establishing the finished**

grades beneath the proposed security building (see item 13 below). The fine-grained soil of Stratum 1B is not suitable for use as compacted structural fill and should be stockpiled separately for use within non-structural (landscaped) areas only.

13. Imported structural fill, if required, should be a clean well-graded sand and gravel, free of all organic material and contaminates, with a maximum particle size of three (3) inches, between ten (10) and seventy (70) percent by weight passing the standard No. 40 sieve size and no more than twelve (12) percent passing the No. 200 standard sieve size. Suitability should be determined in accordance with ASTM D422 Standard (Particle Size Analysis).
14. Compact the structural fill in maximum loose lifts of eight (8) inches to at least ninety-five (95) percent of its maximum dry density as determined in the laboratory in accordance with the ASTM D1557 Standard.

Shallow Foundations

1. The proposed security building can be supported on compacted in-place soil (Strata PF and 1A) or compacted structural fill using a shallow foundation system, such as continuous and isolated spread footings.
2. Use a maximum allowable soil bearing capacity of one-thousand-five-hundred (1,500) psf for spread footing design, provided the site and spread footing subgrades are prepared in accordance with the recommendations described herein.
3. Use spread footing foundations bearing on compacted in-place soil (Strata PF and 1) or compacted structural fill at least two-and-one-half (2.5) feet below the final exterior site grades for frost heave protection.
4. Continuous and isolated spread footings should have minimum widths of wo (2) and three (3) feet, respectively, even if the geometry produces a bearing pressure less than that recommended. Continuous and isolated spread footings should have maximum widths of two (2) and three (3) feet, respectively, to minimize stresses imparted on underlying weaker subgrade soil and thereby limit post construction settlement.
5. It is estimated that total and differential settlement will be less than one (1) inch and one-half (0.5) of an inch over twenty-five (25) feet, respectively, provided the site and subgrades are prepared in accordance with the recommendations described herein.

Slab-On-Grade

1. The proposed security building slab-on-grade can be supported on compacted in-place soil (Strata PF and 1A) or compacted structural fill.
2. The slab-on-grade should be isolated from columns, walls and foundations to permit differential movement, concrete shrinkage and thermal expansion/ contraction.

3. Use a modulus of subgrade reaction (k) of one-hundred-fifty (150) pci for slab thickness and reinforcement design, provided the site and subgrades are prepared in accordance with the recommendations described herein.
4. Concrete slabs should be provided with suitable reinforcement and joints in accordance with the American Concrete Institute (ACI) guidelines to help control cracks resulting from differential movement and concrete shrinkage.

Seismic Considerations

1. A site class "D" and site coefficients F_a = 1.6 and F_v = 2.4 should be used for seismic design purposes.
2. A maximum considered earthquake spectral response acceleration at short periods (S_s) of 14.1% g should be used for seismic design purposes.
3. A maximum considered earthquake spectral response acceleration at 1-second period (S_1) of 5.1% g should be used for seismic design purposes.
4. It is our opinion that the subgrade has a moderate probability of liquefaction due to the presence of granular soil below the static groundwater table. The structural engineer should consider this liquefaction probability to determine if any additional structural considerations are needed based upon the probability of an earthquake large enough occurring in the area to induce liquefaction, the use of the structure and the cost to reduce the liquefaction potential of the soil mass.
5. Reference is made to the 2015 International Building Code (IBC)-New Jersey Edition for additional seismic-related criteria for foundation design.

FIELD GEOTECHNICAL QUALITY ASSURANCE

Due to the limitations of this geotechnical exploration and evaluation, it is possible that the site subgrade conditions apart from the test boring locations may differ from those encountered at the test boring locations. Therefore, a qualified and experienced Geotechnical technician under the supervision of a professional engineer licensed in the State of New Jersey should observe and document the following construction tasks in order to verify that the recommendations presented herein are implemented or modified as necessary to account for possible differing site subgrade conditions:

- Demolition and removal of existing structural elements, concrete and asphalt, including removing, relocating, or abandoning (grouting) existing underground utilities from within the proposed security building footprint area and at least five (5) feet outboard of the proposed perimeters
- Removal of any vegetation, topsoil, unsuitable (deleterious) fill, buried debris and organic material from within the proposed

security building footprint area and at least five (5) feet outboard of the proposed perimeters

- Heavy compaction (proof-rolling) of the in-place soil within the proposed security building footprint area and at least five (5) feet outboard of the proposed perimeters
- Supply and placement of compacted structural fill, if required
- Excavation and compaction of spread footing bearing levels to a visually stable condition immediately prior to placement of reinforcement and concrete
- Compaction of slab-on-grade subgrade level to a visually stable condition immediately prior to placement of any subbase, reinforcement and concrete

Upon request, Maser Consulting P.A. can provide a proposal to perform the above field geotechnical quality assurance services using our qualified, experienced and trained Geotechnical technicians and engineers.

LIMITATIONS

The comments, conclusions and recommendations above are based on the data obtained from the test borings performed at the indicated specific locations and from other identified information. This report does not reflect any variations, which may occur between the test borings or across the site apart from the test boring locations. The nature and extent of such variations may not become evident until construction. If variations appear evident or if the proposed security building is modified, it will be necessary to re-evaluate the comments, conclusions and recommendations presented within this report.

We trust the above information will allow you to proceed with the design and construction of the proposed security building.

We thank you for the opportunity of providing this service. Should you have any questions regarding this report, or if we can be of further assistance, please do not hesitate to contact us.

Very truly yours,
MASER CONSULTING P.A.

Rebeka Pedrick, PE
Project Manager
NJ#24GE05310700

Eduardo Freire, PE
Senior Project Manager
NJ#24GE04339100

6RXUFH 8QLWHG6WDWHV*HRORJLFDO6XUYH\

3UHSDUHG)RU

ATLANTICCAPE COMMUNITY COLLEGE

3UHSDUHG%\

MASER CONSULTING P.A.

6,7(/2&$7,21

$&&3URSRVHG6FXULW\%XLOGLQJ

%ODFNHKRUVH3LNH

N
W E
S

UDZQ%\	&KHFNHG%\	3URMHFW1R
6FDOH 1 7 6	'DWH	)LJXUH1R

)HHW

Source: NJ Office of Information Technology, Office of Geographic Information Systems (NJOIT - OGIS)

LEGEND

INDICATES THE NUMBERS AND APPROXIMATE LOCATIONS OF TEST BORING PERFORMED FOR THIS EXPLORATION PROGRAM.

0 50 100 200 Feet

N

Prepared For:

ATLANTIC CAPE COMMUNITY COLLEGE

Prepared By:

Charlotte Office
5275 Parkway Plaza Blvd Ste 100
Charlotte, NC 28217
T: 704.973.7962
www.maserconsulting.com

MASER CONSULTING P.A.

TITLE:

EXPLORATION LOCATION PLAN

PROJECT:

ACCC Proposed Security Building
5100 Black Horse Pike

MAYS LANDING
ATLANTIC COUNTY, NJ

Drawn By:	MAM	Checked By:	RP	Project No.:	20C002055E
Scale:	1 IN = 100 FT	Date:	5/5/2020	Figure No.:	2

Engineers
Planners
Surveyors
Landscape Architects
Environmental Scientists

5439 Harding Highway
Mays Landing, NJ 08330
T: 800.258.3787
T: 609.625.1700
F: 609.625.1798
www.maserconsulting.com

FIELD SOIL & ROCK CLASSIFICATION SYSTEM

Maser Consulting P.A. uses the following definitions, abbreviations and terminologies to classify and correlate soil and rock samples in the field.

Soil samples are described as follows:
USCS Group Name, USCS group symbol, color, state, moisture condition, fabric (fibrous, cemented, varved, lenses, Saprolite) and odor (hydrocarbon-like, organic, etc.)

Rock cores are described as follows:
Type, color, hardness, degree of weathering, fracture spacing, quality, and if applicable: bedding thickness, relative dip and spacing of joints.

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS – ASTM D-2488) symbols and group names are:

SOIL PARTICLE SIZE IDENTIFICATION

	Diameter		Sieve Retained
Boulders	Greater than 12 inch		12”
Cobbles	3 to 12 inch		3”
Gravel	Coarse -	0.75 to 3 inch	¾”
	Fine -	4.75 mm to 0.75 inch	#4
Sand	Coarse -	2.0 to 4.75 mm	#10
	Medium -	0.425 to 2.0 mm	#40
	Fine -	0.075 to 0.425 mm	#200
Silt & Clay	Smaller than 0.075 mm		Passing #200

MODIFIERS

Description	Percent (by weight)
Trace (tr)	1 – 4
With (w/)	5 – 12 (dual symbol)
Adjective (ly)	13 – 44
Borderline (/)	45 – 55

COARSE GRAINED SOIL

GP or GW	Poorly or well graded gravel
GM or GC	Silty or clayey gravel
GP-GM	Poorly graded gravel with silt
GP-GC	Poorly graded gravel with clay
GW-GM	Well graded gravel with silt
GW-GC	Well graded gravel with clay
SP or SW	Poorly or well graded sand
SM or SC	Silty or clayey sand
SP-SM	Poorly graded sand with silt
SP-SC	Poorly graded sand with clay
SW-SM	Well graded sand with silt
SW-SC	Well graded sand with clay

FINE GRAINED & ORGANIC SOIL

ML	Silt of low plasticity
CL	Clay of low plasticity
ML/CL	Clayey silt of low plasticity
CL/ML	Silty clay of low plasticity
MH	Silt of high plasticity
CH	Clay of high plasticity
MH/CH	Clayey silt of high plasticity
CH/MH	Silty clay of high plasticity
---	---
OL	Organic silt/clay of low plasticity
OH	Organic silt/clay of high plasticity
PT	Peat and highly organic soil

STANDARD PENETRATION TEST (SPT – ASTM D-1586) - A 2.0” O.D. (1-3/8” I.D.) split barrel sampler is driven into undisturbed soil by means of a 140 pound weight hammer falling freely a vertical distance of 30 inches in 4 successive 6-inch increments, for a total drive of 24 inches (2 feet). The number of blows required for the middle 12 inches (1 foot) of penetration is the Standard Penetration Resistance (N).

STATE – GRANULAR SOIL (Gravel & Sand)

Density	Approximate N Values
Very Loose	4 blows/ft or less
Loose	5 – 10 blows/ft
Medium Dense	11 – 30 blows/ft
Dense	31 – 50 blows/ft
Very Dense	51 blows/ft or greater

STATE – COHESIVE SOIL (Clay & Silt)

Consistency	Approximate N Values
Very Soft	1 blow/ft or less
Soft	2 – 4 blows/ft
Medium Stiff	5 – 8 blows/ft
Stiff	9 – 15 blows/ft
Very Stiff	16 – 30 blows/ft
Hard	31 blows/ft or greater

ABBREVIATIONS

Bn - Brown	Wh - White	WOH - Weight of hammer
Tn - Tan	Blk - Black	WOR - Weight of rods
Or - Orange	Gy - Gray	R - Sample recovery (inches)
Yl - Yellow	Lt - Light	NR - No recovery
Rd - Red	Dk - Dark	Misc - Miscellaneous
Gn - Green	Multi - Multi-colored	

ROCK QUALITY DESIGNATION (RQD)

RQD (%)	Description
0 – 25	Very poor
26 – 50	Poor
51 – 75	Fair
76 – 90	Good
91 – 100	Excellent

(RQD: total length of pieces > 4” per attempted run length)

MASER CONSULTING P.A.
Engineers
Planners
Surveyors
Landscape Architects
Environmental Scientists

5439 Harding Highway
Mays Landing, NJ 08330
T: 800.258.3787
T: 609.625.1700
F: 609.625.1798
www.maserconsulting.com

FIELD TEST BORING LOG

CLIENT Atlantic Cape Community College **DATE** 4/24/2020

PROJECT Proposed Security Building - ACCC - 5100 Black Horse Pike - Mays Landing, NJ **MC No.** 20C002055E

BORING NO. B-1 **Sheet 1 of 1** **ELEV.** Ext. Asphalt

Ground Water Data				Method of Advancing Boring	Depth
Depth	Hour	Date	Hrs. After Completion	Drag Bit through Asphalt	0' to 0.5'
				Continuous Split Spoon	0.5' to 8'
5'	9:50AM	4/24/2020	0	Hollow Stem Auger	8' to 25'

Depth	Sample No.	Sample Depth	Sample Blows	Stratum	Soil Classification	Remarks
0		0'-6"		A	3" Asphalt	6"
	S-1A	6"-1'6"	4-5		Poorly graded SAND w/clay (SP-SC) / or, br, loose, moist	tr gravel, possible fill
	S-1B	1'6"-2'	4	PF	Poorly graded SAND w/silt (SP-SM) / tn, or, loose, moist	R=18", possible fill
	S-2	2'-4'	5-5-5-3		Silty SAND (SM) / tn, or, loose, moist	R=19", tr gravel, possible fill
	S-3A	4'-5'	2-2		Clayey SAND (SC) / lt gy, tn, very loose, moist	4'
5	S-3B	5'-6'	2-2		Silty SAND (SM) / dk gy, very loose, wet	R=17", tr organics, tr gravel
	S-4A	6'-7'6"	1-1-1		Silty SAND (SM) / dk gy, bn, very loose, wet	tr organics
	S-4B	7'6"-8'	1		Clayey SAND (SC) / tn, lt gy, very loose, wet	R=18"
	S-5	8'-10'	3-4-4-3		Clayey SAND (SC) / tn, lt gy, loose, wet	R=20"
10	S-6	10'-12'	3-3-6-8		Clayey SAND (SC) / or, bn, loose, wet	R=20"
	S-7	13'-15'	3-4-4-5	1A	Clayey SAND (SC) / tn, lt gy, loose, wet	R=22"
15						
	S-8	18'-20'	2-3-3-5		Clayey SAND (SC) / tn, or, lt gy, loose, wet	R=18"
20						21'6"
	S-9	23'-25'	3-5-6-7	1B	Sandy CLAY (CL) / or, stiff, wet	R=20
25					Test Boring Complete @ 25'	
30						

Additional Remarks:

☐ **S - 2" O.D. Split Spoon Sample** ■ **U - Undisturbed Sample, 3" Diameter** ☒ **- Core Drilling** ☐ **- No Recovery**

Blows - Standard Penetration Resistance per 6" (140# Hammer, 30" drop)

Inspector K. Herman **Driller** C. Blemings (SBD)

Engineers
Planners
Surveyors
Landscape Architects
Environmental Scientists

MASER CONSULTING P.A.

5439 Harding Highway
Mays Landing, NJ 08330
T: 800.258.3787
T: 609.625.1700
F: 609.625.1798
www.maserconsulting.com

FIELD TEST BORING LOG

CLIENT Atlantic Cape Community College **DATE** 4/24/2020

PROJECT Proposed Security Building - ACCC - 5100 Black Horse Pike - Mays Landing, NJ **MC No.** 20C002055E

BORING NO. B-2 **Sheet 1 of 1** **ELEV.** Ext. Asphalt

Ground Water Data				Method of Advancing Boring	Depth
Depth	Hour	Date	Hrs. After Completion	Drag Bit through Asphalt	0' to 0.5'
				Continuous Split Spoon	0.5' to 8'
6'	10:49AM	4/24/2020	0	Hollow Stem Auger	8' to 25'

Depth	Sample No.	Sample Depth	Sample Blows	Stratum	Soil Classification	Remarks
0		0'-6"		A	3" Asphalt	6"
	S-1A	6"-1'6"	6-6		Clayey SAND (SC) / bn, or, medium dense, moist	tr gravel, possible fill
	S-1B	1'6"-2'	7	PF	Poorly graded SAND w/silt (SP-SM) / tn, or, medium dense, moist	R=18", possible fill
	S-2A	2'-3'	4-6			possible fill
	S-2B	3'-4'	6-7		Poorly graded SAND w/silt (SP-SM) / tn, or, medium dense, moist	R=17", possible fill
5					Clayey SAND (SC) / bn, or, medium dense, moist	4'
	S-3	4'-6'	2-1-1-1	1A	Clayey SAND (SC) / bn, dk gy, very loose, moist	R=22", tr gravel
	S-4	6'-8'	2-2-2-2		Clayey SAND (SC) / lt gy, tn, very loose, wet	R=16"
	S-5	8'-10'	3-5-6-8	1B	Sandy CLAY (CL) / lt gy, tn, stiff, wet	8' R=18"
10	S-6	10'-12'	7-6-6-8	1A	Clayey SAND (SC) / lt gy, tn, medium dense, wet	10' R=15"
						12'6"
	S-7	13'-15'	3-2-2-3	1B	CLAY w/sand (CL) / lt gy, tn, or, soft, wet	R=21", orange SP varving
15						
						R=20"
	S-8	18'-20'	1-1-1-1		Sandy CLAY (CL) / or, tn, lt gy, soft, wet	
20						
	S-9A	23'-24'	2-4		CLAY w/sand (CL) / or, lt gy, tn, medium stiff, wet	
	S-9B	24'-25'	4-4	1A	Clayey SAND (SC) / or, loose, wet	24' R=18"
25					Test Boring Complete @ 25'	
30						

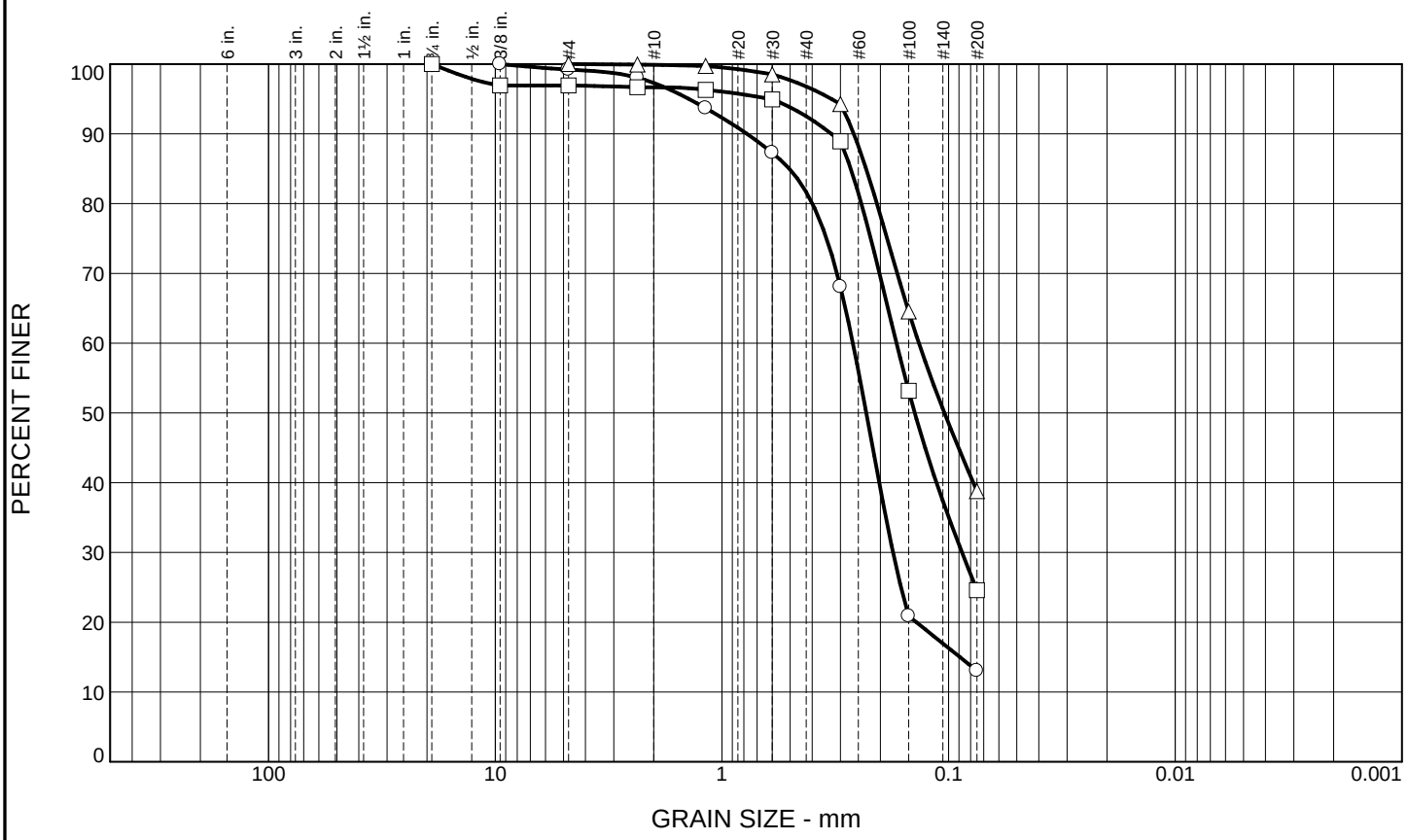
Additional Remarks:

☐ **S - 2" O.D. Split Spoon Sample** ■ **U - Undisturbed Sample, 3" Diameter** ☒ **- Core Drilling** ☐ **- No Recovery**

Blows - Standard Penetration Resistance per 6" (140# Hammer, 30" drop)

Inspector K. Herman **Driller** C. Blemings (SBD)

Particle Size Distribution Report



	Cobbles	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PL	PI
○	0.0	0.8	86.2	13.0		SM\SC			
□	0.0	3.1	72.3	24.6		SM	NV	NP	NP
△	0.0	0.0	61.2	38.8		SC	27	18	9

SIEVE inches size	PERCENT FINER ○	□	△
.75		100.0	
.375	100.0	96.9	
GRAIN SIZE			
D_{60}	0.2645	0.1698	0.1352
D_{30}	0.1758	0.0872	
D_{10}			
COEFFICIENTS			
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	99.2	96.9	100.0
#8	98.1	96.7	99.9
#16	93.7	96.3	99.7
#30	87.3	94.9	98.5
#50	68.1	88.9	94.3
#100	20.9	53.2	64.5
#200	13.0	24.6	38.8

Material Description

○Tan silty\clayey SAND

□Dark gray silty SAND, trace organics

△Light gray, tan clayey SAND

REMARKS:

○

□Water Content (WC): 24.7%
NP: Non-Plastic ; NV: No-Value
Organic Content (OC): 2.7%

△WC: 18.8%

○Source of Sample: B-1 Depth: 2'-4' Sample Number: S-2

□Source of Sample: B-1 Depth: 5'-6' Sample Number: S-3B

△Source of Sample: B-1 Depth: 7'6"-8' Sample Number: S-4B

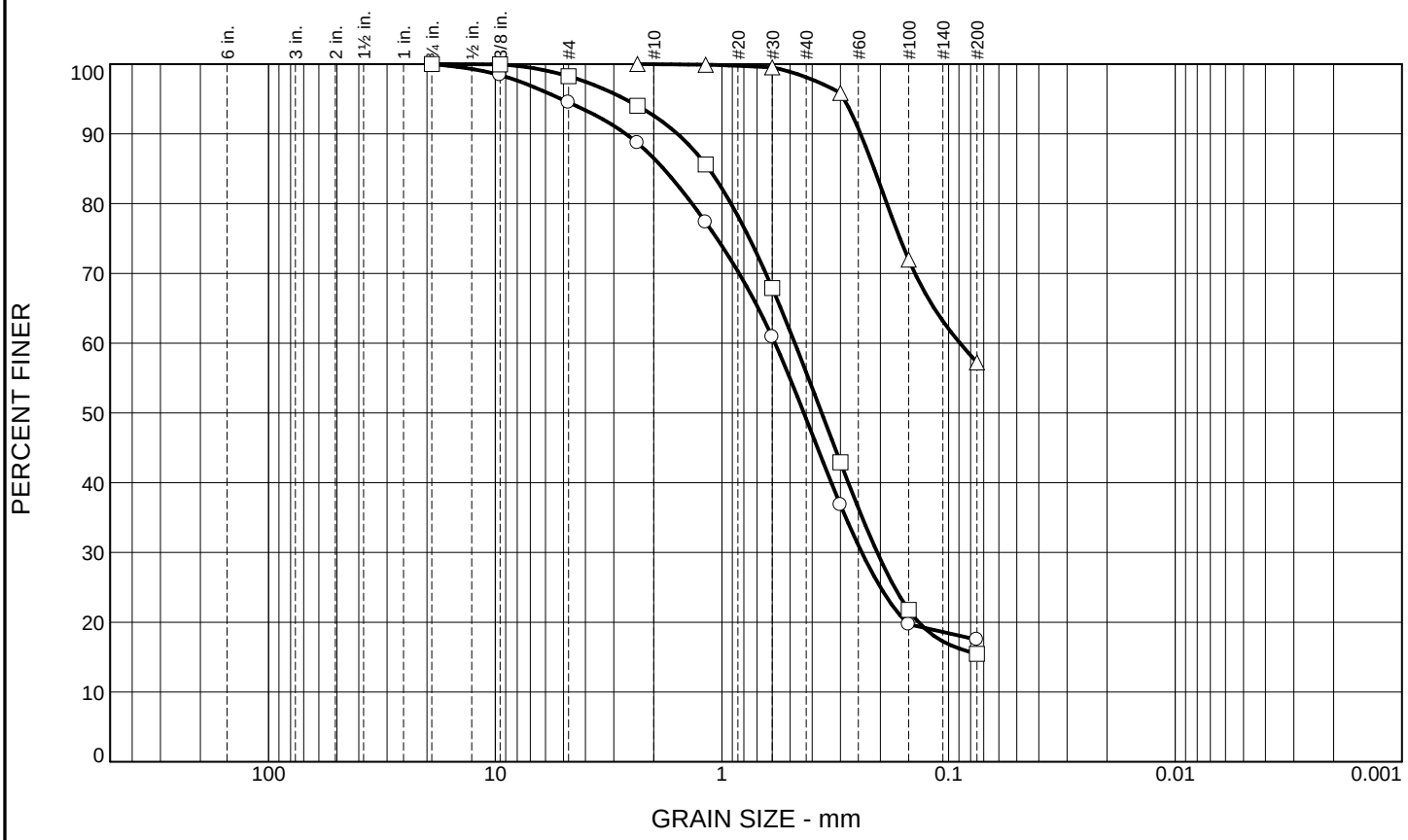
CRAIG TESTING LABORATORIES
a Division of Maser Consulting P.A.
Mays Landing, NJ 609-625-1700

Client: Atlantic Cape Community College

Project: Proposed Security Bldg - 5100 Black Horse Pike
Mays Landing, NJ

Project No.: 20C002055E Figure PSA-1

Particle Size Distribution Report



	Cobbles	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PL	PI
○	0.0	5.5	77.0	17.5		SM\SC			
□	0.0	1.7	82.8	15.5		SM\SC			
△	0.0	0.0	42.8	57.2		CL	34	18	16

SIEVE inches size	PERCENT FINER ○	□	△
.75	100.0	100.0	
.375	98.4	100.0	
	GRAIN SIZE		
D_{60}	0.5832	0.4768	0.0891
D_{30}	0.2415	0.2065	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	94.5	98.3	
#8	88.7	94.0	100.0
#16	77.3	85.6	99.9
#30	60.9	67.9	99.5
#50	36.8	42.9	95.9
#100	19.7	21.8	72.0
#200	17.5	15.5	57.2

Material Description

○Orange silty\clayey SAND

□Brown, dark gray silty\clayey SAND

△Light gray sandy lean CLAY

REMARKS:

○

□

△WC: 15.4%

○Source of Sample: B-2 Depth: .5'-1.5' Sample Number: S-1A

□Source of Sample: B-2 Depth: 4'-6' Sample Number: S-3

△Source of Sample: B-2 Depth: 8'-10' Sample Number: S-5

CRAIG TESTING LABORATORIES
a Division of Maser Consulting P.A.
Mays Landing, NJ 609-625-1700

Client: Atlantic Cape Community College

Project: Proposed Security Bldg - 5100 Black Horse Pike
Mays Landing, NJ

Project No.: 20C002055E Figure PSA-2

SECTION 024113-SITE DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Demolition of designated site structures and foundations, retaining walls and foundations and removal of materials from site.

B. Demolition and removal of pavements, curbs and gutters, drainage structures, utilities, signage or landscaping.

C. Recycling of asphalt and concrete.

D. Removing, disconnecting and capping or removal of identified utilities.

E. Filling or removal of underground tanks, piping, and appurtenances, in accordance with all applicable State and Local requirements.

F. Filling voids in subgrade created as a result of removals or demolition.

G. Hazardous material compliance.

H. Shoring and bracing as warranted by project conditions.

1.2 RELATED WORK SECTIONS

A. Section 311000, Site Clearing.

B. Section 312000, Earth Moving.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT- NOT USED

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable State and local codes for demolition of structures, safety of adjacent structures, dust control, and runoff control.

B. Obtain all required permits and licenses from appropriate authorities. Pay associated fees including disposal and recycling charges.

C. Notify affected utility companies before starting work and comply with their requirements.

D. Do not close or obstruct public or private roadways, sidewalks, or fire hydrants without appropriate permits or written authorization.

E. Conform to applicable regulatory procedures when hazardous or contaminated materials are discovered.

F. Test soils around buried tanks for contamination.

1.5 QUALITY ASSURANCE

A. Conform to applicable environmental requirements, including the disposal of debris and erosion control.

B. Perform Work in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

C. Perform Work in accordance with the Standards for Erosion Control in New Jersey and the approved Soil Erosion and Sediment Control Plan.

D. Maintain one copy of the Soil Erosion and Sediment Control Plan on site.

1.6 SUBMITTALS

A. Accurately measure and record locations of capped utilities and subsurface obstructions that will remain after demolition. Submit locations on As-Built Plan prior to project Close Out.

B. Demolition Schedule including Shut Off and continuation of utility services dates. Provide a detailed schedule indicating methods, removal sequence, and disposal methods to ensure uninterrupted operation of occupied areas.

C. Submit Tickets or other satisfactory evidence to verify legal disposal of regulated materials,

1.7 PROJECT CONDITIONS

A. Owner assumes no responsibility for condition of structures to be demolished.

B. Conditions, existing at time of inspection for bidding purposes will be maintained by Owner as reasonably practical. Variations within structures may occur by Owner's removal and salvage operations prior to start of demolition work.

C. Unless otherwise indicated in Contract Documents or specified by the Owner, items of salvageable value to Contractor shall be removed from site and structures. Storage or sale of removed items on site will not be permitted and shall not interfere with other work specified in Contract Documents.

D. Explosives shall not be brought to or used on site.

PART 2 PRODUCTS

2.1 FILL AND BACKFILL MATERIALS

A. Materials shall comply with related sections.

PART 3 EXECUTION

3.6 PREPARATION

A. Provide, erect, and maintain soil erosion control devices, temporary barriers, and security devices at locations indicated on Construction Drawings.

B. Protect existing landscaping materials, appurtenances, and structures, which are not to be demolished. Repair damage caused by demolition operations at no cost to Owner.

C. Prevent movement or settlement of adjacent structures. Provide bracing and shoring as needed.

D. Mark location of utilities. Protect and maintain in safe and operable condition utilities that are to remain. Prevent interruption of existing utility service to occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities as acceptable to governing authorities and Owner.

E. Notify adjacent owners of work that may affect their property, potential noise, utility outages or disruptions. Contractor to coordinate with Owner.

3.7 DEMOLITION REQUIREMENTS

A. Conduct demolition to minimize interference with adjacent structures or pavements.

B. Cease operations immediately if adjacent structures appear to be in danger. Notify authority-having jurisdiction. Do not resume operations until directed by authority.

C. Conduct operations with minimum of interference to public or private access. Maintain ingress and egress at all times.

D. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon, or limit access to their property.

E. Sprinkle work with water to minimize dust. Provide hoses and water connections for this purpose. Water is not to be used in a manner that creates hazardous or objectionable conditions.

F. Comply with governing regulations pertaining to environmental protection.

G. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

3.8 DEMOLITION

A. Locate demolition equipment and remove materials so as to prevent excessive loading to supporting walls, floors, or framing.

B. Demolish concrete and masonry in small sections. Break up concrete slabs-on-grade that are 2-feet or more below proposed subgrade to permit moisture drainage. Contractor shall remove slabs-on-grade and below grade construction within 18 inches of proposed subgrade.

C. All asphalt and concrete curbs, walkways, driveways, and ramps shall be sawcut as shown on the plans and removed to the sawcut limits.

3.9 FILLING AND BACKFILLING

A. Completely fill below grade areas and voids resulting from demolition or removal of structures, underground fuel storage tanks, wells, cisterns, etc., using approved select fill materials consisting of stone, gravel, and sand free from debris, trash, frozen materials, roots, and other organic matter.

B. Ensure that areas to be filled are free of standing water, frost, frozen or unsuitable material, trash, and debris prior to fill placement.

C. Place fill materials in accordance with Related Sections.

D. Grade surface to match adjacent grades and to provide flow of storm runoff to surface drainage collection structures after fill placement and compaction.

3.5 REPAIRS

A. The Contractor shall repair and/or replace all damaged areas at the discretion of the Engineer and to the satisfaction of the Owner at no additional expense to the Owner.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove from the site debris, rubbish, and other materials resulting from demolition operations. Leave areas of work in clean condition.

B. No burning of any material, debris, or trash will be allowed.

C. Transport materials removed from the site with appropriate vehicles and legally dispose of off-site to areas that are approved for disposal by governing authorities and appropriate property owners.

D. Demolition and removal of debris shall be conducted in a manner to ensure minimal interference with local vehicular and pedestrian traffic on adjacent public and private facilities.

3.8 CLEANUP

A. During the Demolition phase, the Contractor shall continually and promptly remove unused tools, equipment, material, debris, and dust and maintain area affected by the demolition work in a clean and approved condition acceptable to the Engineer.

B. The Contractor shall clean all adjacent structures and facilities of dust and debris caused by the Demolition phase as directed by the Engineer and /or local authorities. All adjacent areas and structures are to be returned to a condition equal to or better than existed prior to the Demolition phase.

C. The Contractor shall clean and sweep on a daily basis all public and private roads and sidewalks affected by the Demolition .

END OF SECTION 024113

SECTION 033000 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY

A. Extent of concrete work is shown on drawings.

B. Concrete paving and walks are specified in Division 2.

1.3 SUBMITTALS

A. Product Data: Submit data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds and others as required by Architect.

B. Samples: Submit samples of materials as requested by Architect, including names, sources and descriptions.

C. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test.

D. Materials Certificates: Provide materials certificates in lieu of materials laboratory test reports when permitted by Architect. Materials certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

E. Shop Drawings: Reinforcement: Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing diagrams of bent bars, arrangement of concrete reinforcement.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:

1. ACI 301 "Specifications for Structural Concrete for Buildings".
2. ACI 318 "Building Code Requirements for Reinforced Concrete".
3. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice".

B. Concrete Testing Service: Engage a testing laboratory acceptable to Architect to perform

material evaluation tests and to design concrete mixes.

C. Materials and installed work may require testing and retesting at anytime during progress of work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Steel Wire: ASTM A 82, plain, cold-drawn steel.

C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.

D. Welded Deformed Steel Wire Fabric: ASTM A 497.

E. Supports for Reinforcement: Bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications.

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type II.

1. Use one brand of cement throughout project, unless otherwise acceptable to Architect.

B. Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.

C. Water: Potable.

D. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

1. Products: Subject to compliance with requirements, provide one of the following:

a. "Air-Mix"; Euclid Chemical Co.
b. "Sika Aer"; Sika Corp.
c. "MB-VR or MB-AE"; Master Builders.
d. "Darex AEA" or "Daravair"; W.R. Grace.

E. Water-Reducing Admixture: ASTM C 494, Type A, and containing not more than 0.05 percent chloride ions.

1. Products: Subject to compliance with requirements, provide one of the following:

a. "WRDA" Hycol"; W.R.Grace.
b. "Eucon WR-75" or "Eucon WR-89"; Euclid Chemical Co.
c. "Pozzolith 322N"; Master Builders.

F. High-Range Water-Reducing Admixture (Super Plasticizer) ASTM C 494, Type F or Type G and containing not more than 0.05 percent chloride ions.

1. Products: Subject to compliance with requirements, provide one of the following:

a. "Daracem 100" or "WRDA-19"; W.R. Grace.
b. "Eucon 37"; Euclid Chemical Co.
c. "Rheobuild 1000"; Master Builders.
d. "Sika 86"; Sika Corporation.

G. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C 494, Type E, and containing not more than 0.024 percent chloride ions.

1. Products: Subject to compliance with requirements, provide one of the following:

a. "Accelguard 80"; Euclid Chemical Co.
b. "Daraset"; W.R. Grace

H. Water-Reducing, Retarding Admixture: ASTM C 494, Type D and containing not more than 0.05 percent chloride ions.

1. Products: Subject to compliance with requirements, provide one of the following:

a. "Pozzolith Retarder"; Master Builders.

b. "Eucon Retarder 75"; Euclid Chemical Co.
c. "Daratard 17"; W.R. Grace.
d. "Plastocrete 161R"; Sika Corporation.

I. Prohibited Admixtures: Calcium chloride thyocyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.

2.4 RELATED MATERIALS

A. Extruded Polystyrene Board Insulation: Rigid closed-cell extruded, expanded polystyrene insulation board with integral high-density skin, complying with ASTM C-578 Type IV: min. 25 psi compressive strength ASTM D 1621: k value of 0.20 ASTM C 518: 0.30% maximum water absorption ASTM C272: 1.1 perm/inch max water vapor transmission: manufacturer's standard length and widths.

1. Manufacturer: Subject to compliance with requirements, provide products of one of the following or an approved equivalent:

a. Dow Chemical Co: Midland MI
b. VC Industries/V.5 Gypsum: Chicago, IL.

B. Non-Shrink Grout: CRD-C 621, factory pre-mixed grout.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements provide one of the following:
3. Non-metallic

a. "Euco-NS"; Euclid Chemical Co.
b. “Duragrout”; L&M Construction Chemicals, Inc.
c. "Masterflow 713"; Master Builders
d. "Five Star Grout"; U.S. Grout Corporation.

C. Absorptive Cover: Burlap cloth made from jute or kenaf weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

D. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.

1. Waterproof paper.
2. Polyethylene film.
3. Polyethylene-coated burlap.

E. Clear curing and sealing compound (VOC Compliant): The compound shall have 30% solids content minimum, and will not yellow under ultraviolet light after 500 hours of test in accordance with ASTM C-1315 and will have test data from an independent testing laboratory indicating a maximum moisture loss of 0.039 grams per sq. cm. when applied at a rate of 300 sq. ft. per gallon. Sodium silicate compounds are not permitted.

1. Product: “Super Aqua-Cure VOX” by Euclid Chemical Co.
2. Product: “Dress & Seal WB30” by L&M Construction Chemicals, Inc
3. Product: “Kure-n-Seal 30 VOC” by Sonneborne
4. Or approved equivalent.

F. Vapor Barrier: Provide vapor barrier which conforms to ASTM E1745, Class A. The membrane shall have a water-vapor transmission rate no greater than 0.01 gr./ft^2/hr/inch Hg when tested in accordance with ASTM E96. The vapor barrier shall be placed over prepared base material where indicated below slabs on grade. Vapor barrier shall be no less than 15 mil thick. Installation of vapor barrier to comply with ASTM E1643.

1. Product: Stego Wrap (15 mil) Vapor Barrier by Stego Industries LLC
2. Product: VaporBlock (15 mil) by Raven Industries
3. Product: Zero Perm by Alumiseal
4. Product: Premoulded Membrane with PLASMATIC CORE by W.R. Meadows.

2.5 PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.

B. Submit written reports to Architect and Structural Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect.

C. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:

D. 3000 psi 28-day compressive strength; W/C ratio, 0.51 maximum, 3500 psi 28-day compressive strength W/C ratio, 0.47 maximum.

E. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results or other circumstances warrant; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be admitted to and accepted by Architect before using in work.

F. Admixtures:

1. Use water-reducing admixture or high range water-reducing admixture (super plasticizer) in concrete as required for placement and workability.
2. Use high-range water-reducing admixture in pumped concrete, concrete for industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight and concrete with water/cement ratios below 0.50.

3. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.
4. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having air content within following limits.

    a. 5% for maximum 2" aggregate
    b. 6% for maximum 3/4" aggregate
    c. 7% for maximum 1/2" aggregate

G. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Ramps, slabs and sloping surfaces: Not more than 3".
2. Reinforced foundation systems: Not less than 1" and not more than 3".
3. Concrete containing HRWR admixture (super-plasticizer): Not more than 8" after addition of HRWR to site-verified 2"-3" slump concrete.
4. Other concrete: Not less than 1" nor more than 4"

2.6 CONCRETE MIXING

A. Ready-Mix Concrete: Comply with requirements of ASTM C94, and as herein specified.

B. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

PART 3 - EXECUTION

3.1 FORMS

A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structure are of correct size, shape, alignment, elevations and position.

B. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keywarp, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features, required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

3.2 PLACING REINFORCEMENT

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

1. Avoiding cutting or puncturing vapor retarder during reinforcement placement and concreting operations.

B. Clean reinforcement of loose rust and mill scale, earth, ice and other materials which reduce or destroy bond with concrete.

C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.

D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.3 JOINTS

A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate at a maximum spacing of 90 feet, so as not to impair strength and appearance of the structure, as acceptable to Architect.

B. Control Joints: Locate and install control joints as indicated or at a maximum spacing of 30 feet. Locate at a spacing which does not impair appearance of the structure as acceptable to Architect. Use “SOFFCUT” saw to cut joints in slab. Joint to be cut the same day as the pour.

C. Joint filler and sealant materials are specified in Division-7 sections of these specifications.

3.4 INSTALLATION OF EMBEDDED ITEMS

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.

B. Edge Forms and Screed Strips for Slabs: Set edge forms, or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

3.5 CONCRETE PLACEMENT

A. Preplacement inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

1. Apply temporary protective covering to lower 2' of finished walls adjacent to poured floor slabs and similar conditions, and guard against spattering during placement.

B. General: Comply with ACI 304R "Guide for Measuring, Mixing, Transporting and Placing Concrete", and as herein specified.

C. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

E. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

F. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

G. Maintain reinforcing in proper position during concrete placement operations.

H. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which would be caused by frost, freezing actions or low temperatures, in compliance with ACI 306R.

I. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

J. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305R.

3.6 MONOLITHIC SLAB FINISHES

A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with

membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.

B. After screeding, consolidating and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to tolerances of Ff18 - Fl15. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.

D. After floating, begin first trowel finish operation using a power driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of Ff20 - Fl17. Grind smooth surface defects which would telegraph through supplied floor covering system.

E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps and elsewhere as indicated.

3.7 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

C. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

D. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing and by combinations thereof, as herein specified.

E. Provide moisture curing by following methods.

1. Keep concrete surface continuously wet by covering with water.
2. Continuous water-fog spray.
3. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to

provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

F. Provide moisture-cover curing as follows:

1. Cover concrete surfaces with moisture-retaining cover for curing concrete, place in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

G. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting and other coatings and finish materials, unless otherwise acceptable to Architect.

H. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.

I. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture retaining cover, unless otherwise directed.

3.8 MISCELLANEOUS CONCRETE ITEMS

A. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

B. Grout base plates and foundations as indicated, using specified non-shrink grout. Use non-metallic grout for exposed conditions, unless otherwise indicated.

3.9 CONCRETE SURFACE REPAIRS

A. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.

B. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets and other objectionable conditions.

C. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

D. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.

E. Underlayment Application: Leveling of floors for subsequent finishes may be achieved by use of specified underlayment material.

3.10 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. The Owner will employ a testing laboratory to perform the following tests, inspect formwork and reinforcement placement and to submit test reports.

B. Sampling and testing for quality control during placement of concrete may include the following, as directed by Architect.

C. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

1. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
2. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.

D. Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

E. Compressive Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yds. plus additional sets for each 50 cu. yds. over and above the first 25 cu. yds. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

F. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

G. Test results will be reported in writing to Architect, Structural Engineer and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.

H. Nondestructive Testing: Impact hammer, sonoscope or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

I. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

END OF SECTION 033000

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Mortar and grout.
3. Steel reinforcing bars.
4. Masonry joint reinforcement.
5. Ties and anchors.
6. Miscellaneous masonry accessories.

B. Related Work Specified Elsewhere:

1. Division 03 Section “Cast-In-place Concrete” for installing dovetail slots for masonry anchors.
2. Division 04 Section “Manufactured Masonry Veneer” for furnishing stone veneer.
3. Division 04 Section “Miscellaneous Metal Fabrications” for furnishing steel lintels and shelf angles.
4. Division 07 Section “Sheet Metal Flashing and Trim” for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

C. Products furnished under other sections for installation under this section includes but is not necessarily limited to the following:

1. Division 03 Sections for reinforcing bars for anchoring concrete floor and/or roof slabs.
2. Division 05 Sections for loose steel lintels, shelf and relieving angles, leveling plates, bars, angles, etc.
3. Division 07 Sections for manufactured reglets for metal flashing
4. Division 08 Sections for hollow metal frames.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following: Layouts at 1/4” scale, details at 3” scale.

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
4. Anchor sections of adjustable masonry anchors, ties, joint reinforcing, accessories.
5. Anchorage between different materials.
6. Expansion and control joints.
7. Each type joint reinforcing, ties, anchors, accessories, etc.

C. Samples for Verification: For each type and color of the following:

1. Accessories embedded in masonry.

D. Material Certificates: For each type and size of the following:

1. Masonry units.

a. Include data on material properties .
b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

F. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.

G. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

H. Submit Certification of Compliance with ASTM C 270 “Mortar for Unit Masonry”, Portland cement/lime type mortar.

1.6 QUALITY ASSURANCE

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

C. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

D. Thin Brick Veneer for grinding shall meet: ASTM C1634, ASTM C90, ASTM C33, ASTM C140, ASTM E514

1.7 DELIVERY STORAGE AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

F. Limit moisture absorption during delivery and until time of installation of the maximum percentage allowed by ASTM C 90 for the average annual relative humidity as reported by the U.S. Weather Bureau Station nearest the Project site.

1.8 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

F. Do not lay masonry units which are wet or frozen.

1. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
2. Remove all masonry determined to be damaged by freezing conditions.
3. Protection of masonry against freezing when the temperature of the surrounding air is 40° F. and falling. Heat materials and provide temporary protection of completed portions of masonry work.

G. Furnish and install all temporary bracing required to prevent damage or stress to new and existing masonry work by reason of wind or other loads which may be superimposed on the work. Provide all bracing rigid, secure and solidly anchored against movement. Remove when no longer required. The Contractor shall be solely responsible for any damage incurred to the masonry work, including contingent and/or related damage, due to failure to properly brace and protect against external forces.

1.9 COORDINATION

A. Contractor will cooperate with other trades and Contracts in building their work and equipment as masonry work progresses as follows:

1. Contractor shall thoroughly familiarize itself with mechanical and electrical Drawings and build at proper locations and elevations all openings for registers, grilles, louvers slots, chases, pipes, vents, heating units, drinking fountains, ducts, etc. as required; cut neatly around all ducts, pipes, etc., where required. Mortar solid the joints between cut openings and face of pipe sleeves, conduit runs and ductwork so that no opening exists through the masonry.
2. Set loose lintels, bearing and base plates, joint covers, anchor bolts, expansion assemblies, sleeves, and other miscellaneous work that must be built into masonry in accordance with Drawings.
3. Where so directed, chases are to be filled in solid at floors with masonry after piping is installed to prevent spreading of fire or vermin.
4. Build in conduit, plugs, sleeves, etc. as required for fastening of telephone panels, electric, switches, receptacles, controls, etc. required by Mechanical and Electrical Contractors.
5. Build carefully against all flashings. All surfaces to receive flashings shall be smooth, hard, free from projection, and satisfactory for work of other Contractors.
6. Firestop masonry openings after setting sleeves or installation of ducts, conduit and other work in such manner as to maintain the nominal fire resistive rating of the wall or partition.
7. Restore masonry openings after setting sleeves or installation of ducts, conduit, and other work.

PART 2 - PRODUCTS

2.1 MASONRY UNITS

A. Manufacturer: Obtain masonry units from one Manufacturer, of uniform texture and color for each type, kind, face, and profile required for each continuous area, visually related areas and to match existing masonry units and/or to match samples selected by Architect.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.2 CONCRETE MASONRY UNITS

A. Regional Materials: Provide CMUs that have been manufactured within 500 miles (800 km) of Project site from aggregates**,** cement and mortar that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. At interior locations, provide bullnose units at all exposed interior outside corners unless otherwise indicated.
3. Provide solid CMU’s as required to maintain continuity of fire ratings and integrity of wall construction. Texture, color and visual appearance of special block shall match that used in adjacent work.

C. CMU’s: ASTM C 90

1. Foundation Units (Below grade): ASTM C 90 solid, load bearing units, Normal weight density classification (125 lbs/cu ft, or greater, oven dry weight of concrete), minimum compressive strength of 1900 net area psi, with at least 75% cross sectional area at bedding surfaces (bed faces)
2. Above grade units (not exposed to exterior): ASTM C 90 hollow load bearing units, Medium weight density classification (105 to 125 lbs/cu ft), oven dry weight of concrete, expanded 100% shale, clay or slate aggregate, nominal 4" units at fire-rated walls shall be minimum 75% solid cross sectional area at bedding surfaces (bed faces), minimum compressive strength 1900 net area psi except Smooth face surface with minimal voids ready to accept painting system

2.3 THIN BRICK VENEER

A. General: Provide below product or approved equal

Basis of Design:	
Manufacturer:	Westbrook Concrete Block Company
Product	Westbricks Thin with Pozzotive
Texture:	Ground Face
Color #:	Overcast (final approval by owner)
Size:	3/4” thickness, 3 5/8”H x 23 5/8”L

1. Units shall be manufactured with water repellant admixture, to comply with manufacturer’s recommendation.
2. Substrate:
   a. Must meet manufacturers qualifications and standards.
   b. Prefabricated panels of structural galvanized steel support ledge and secure tie system for thin brick.

2.4 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Mortar Cement: ASTM C 1329.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following, or equivalent:

   a. Lafarge North America Inc.; Lafarge Mortar Cement or Magnolia Superbond Mortar Cement.

E. Colored Cement Product: Packaged blend made from portland cement and hydrated lime or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following, or equivalent:

   a. Colored Portland Cement-Lime Mix:

      1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
      2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
      3) Lafarge North America Inc.; Eaglebond Portland & Lime.
      4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.

b. Colored Masonry Cement:

1) Capital Materials Corporation; Flamingo Color Masonry Cement.
2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Masonry Cement.
3) Lafarge North America Inc.; U.S. Cement Custom Color Masonry Cement.
4) Lehigh Cement Company; Lehigh Custom Color Masonry Cement.

2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
3. Pigments shall not exceed 10 percent of portland cement by weight.

F. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

G. Aggregate for Grout: ASTM C 404.

H. Cold-Weather Admixture: Non-chloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. The use of this product is subject to acceptability by laboratory testing with mortar mix used.

2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following, or equivalent:

a. Euclid Chemical Company (The); Accelguard 80.
b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.

I. Accelerators: Non-chloride admixtures may be used to speed set-up of mortar in cold weather construction.

J. Water: Potable.

2.5 REINFORCEMENT

A. Continuous Wire Reinforcing: Provide welded wire units prefabricated in straight lengths of not less than 10 feet with matching prefabricated corner and tee units. Fabricate from cold drawn steel wire complying with ASTM A82, with deformed continuous side rods and plain cross

rods, and a unit width of 1-1/2" to 2" less than thickness of single and multi-wythe wall or partition.

B. Provide units fabricated as follows:

1. Fabricated with single pair of 9 gauge side rods and 9 gauge continuous diagonal crossrods spaced not more than 16" on center. Ladder type in exterior wall construction. Truss type in interior wall construction.
2. For multi-wythed exterior walls, provide continuous adjustable pintle-eye type units at coursing joints where wythes do not match, and for cavity walls with insulation.
3. For interior walls, fabricate from mill galvanized carbon wire.

C. Individual Wire Ties for Masonry:

1. Fabricate from 3/16" cold drawn steel wire, ASTM A 82, unless otherwise indicated, of the length required for proper embedment in wythes of masonry.
2. For use with hollow masonry units with cells laid vertical, provide rectangular shaped ties.
3. For use with solid masonry units, provide ties with ends bent to 90° angles to form hooks not less than 2" long. Where spacing and back up joints do not align, provide offset or adjustable 2 piece ties.

4. For interior walls, fabricate from steel wire with mill galvanized finish.

D. Anchors and Ties:

1. Masonry Ties to Structural Steel: Where shown and/or required, except at fire walls, use weld-on type tie type, 1/4" minimum diameter, Hohmann and Barnard, #VTW, or equivalent. Hot dip galvanized. Furnish lengths required. Coordinate and furnish requirements for weld on anchor tie, Hohmann and Barnard, #359 or 301W, or equivalent, to the Structural Steel Contractor.
2. Masonry Veneer Ties: Flexible Tie 3/4” wide by 12 ga. tie with 1 hole, Hohmann and Barnard, #345-BT-Flexible Tie, or equivalent for attachment to existing masonry backup for cavity wall or composite wall construction; complete with fasteners.
3. Anchor bolts: Galvanized steel, ½” diameter x 16” long with 3” leg or as indicated on drawings.
4. Where shown and/or required as coordinated with cast stone shop drawings, use standard building stone dowels in a non-corrosive material such as stainless steel Type 304.
5. Provide all anchors and ties, straps, etc. required for masonry and cast stone work, as required and recommended by cast stone manufacturer except those indicated to be supplied by the Structural Steel Contractor.
6. Fabricate from steel with hot dip galvanized coating, ASTM A 153, Class B-1, B-2 or B-3.

E. Reinforcing Bars: Deformed Steel, ASTM A615, Grade 60 of the sizes shown.

F. Nonmetallic Premolded Filler Strips: Except at fire rated expansion joints and/or joints between firewalls and intersecting/abutting walls, provide premolded, compressible, elastic fillers of foam styrene or neoprene, 1/2" thick, except as otherwise shown, ASTM D 1752.

G. Premolded Control Joint Strips: Except at fire rated expansion joints and/or joints between firewalls and intersecting/abutting walls, solid rubber control joint RS, RS-TEE series by Hohmann and Barnard or equivalent with a Shore A durometer hardness of 80 (+ or - 5) when tested in conformance with ASTM D-2240; designed for use with standard sash block maintain lateral stability in masonry wall; size and configuration as indicated.

H. Bond Breaker Strips and Dowel Sleeves: 15 pound asphalt roofing felt complying with ASTM D 226.

2.6 CONTROL AND EXPANSION JOINTS

A. Provide vertical expansion, control and isolation joints in masonry where shown and required, but not to exceed 28'-0" spacing, within 10 feet of one side of a corner, at wall offsets, at changes in wall height and directly below shelf angles. Build in related masonry accessory items as the masonry work progresses.

B. Build in flanges of factory fabricated expansion joint units furnished by others. Joint width for sealants 3/8", unless otherwise indicated.

C. Provide approved, rated, expansion joints at joints within and between firewalls and intersecting abutting fire walls including other rated walls and other required rated walls.

2.7 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual", Division 07 Section "Sheet Metal Flashing and Trim", Division 07 Section “Flexible Flashing” and as follows:

1. Fabricate through-wall flashing with sealant stop unless otherwise indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
2. Fabricate metal sealant stops for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam will shed water.
3. Metal Sealant Stop: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
4. Metal Expansion-Joint Strips: Fabricate from stainless steel to shapes indicated.

B. Solder and Sealants for Sheet Metal Flashings: As specified in Division 07 Section "Sheet Metal Flashing and Trim".

C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or urethane.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.9 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime or mortar cement mortar unless otherwise indicated.
3. For exterior masonry, use portland cement-lime or mortar cement mortar.
4. For reinforced masonry, use portland cement-lime masonry cement or mortar cement mortar.
5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion or Property Specification. Mortar types selected and the materials indicated in the project specifications shall be consistent with the structural design requirements of the masonry. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For masonry below grade or in contact with earth, use Type M.
2. For reinforced masonry, use Type S or Type N.
3. For mortar parge coats, use Type S or Type N.
4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.

5. For interior non-load-bearing partitions, Type O may be used instead of Type N.
6. Use Type M mortar to set anchor bolts and grout base plates.

D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections. Provide not less than 8" of masonry between chase and recesses, between case and jamb of openings, and between adjacent chases.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp,

unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.

3.4 LAYING MASONRY WALLS

A. Layout walls in advance for accurate spacing of surface bond patterns, with uniform joint thickness and accurate location of openings, movement-type joints, returns and offsets. Avoid the use of less-than-half size units particularly at corners, jambs, and wherever possible at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond or pattern indicated on Drawings; do not use units with less than nominal 8-inch horizontal face dimensions at corners or jambs. Match, blend and align with existing coursing, pattern and bond, when adding to, or building to adjacent masonry construction. Where

openings in existing masonry construction are modified or closed up, new masonry shall match, blend, align and be toothed in to existing coursing, pattern and bond.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 8-inch horizontal face dimensions at corners or jambs.

D. Lay-up walls plumb and with courses level, accurately spaced and coordinated with other work. Install foundation, cavity wall insulations, etc., where shown and as required.

E. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, remove loose masonry units and mortar clean masonry surfaces that are to receive mortar, and wet brick if required before laying fresh masonry.

F. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

G. Fill space between hollow metal frames and masonry solidly with mortar unless otherwise indicated.

H. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

I. Fill and install vertical reinforcing at foundation units, walls, and piers as indicated.

J. Fill core in below grade CMUs with grout solid with grout, full and free of voids, in locations of concentrated loads and where anchors and bolts are embedded at foundation walls below grade, and similar conditions unless otherwise indicated.

K. Fill cores in hollow CMUs with grout 3 courses 24 inches under bearing plates, beams, lintels, posts, and similar conditions unless otherwise indicated.

L. Wall Bracing: Adequately brace all walls against forces and pressures during entire construction period.

3.5 MORTAR BEDDING AND JOINTS

A. Lay hollow CMUs as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Allow cleaned surfaces to dry before setting.
3. Wet joint surfaces thoroughly before applying mortar.

C. Tool exposed joints, including scored joints in CMU's and precast lintels, slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

E. Batch Control:

1. Measure and batch materials either by volume or weight, such that the required proportions for mortar can be accurately controlled and maintained.
2. Mix mortars with the maximum amount of water consistent with workability to provide maximum tensile bond strength within the capacity of the mortar.
3. Mix mortar ingredients for a minimum of five minutes in a mechanical batch mixer. Use water clean and free of deleterious materials which would impair the work. Do not use mortar which has begun to set, or if more than 2-1/2 hours has elapsed since initial mixing. Re-temper mortar during 2-1/2 hour period as required to restore workability.

3.6 COMPOSITE MASONRY

A. Bond wythes of composite masonry together using one of the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.

   a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.

2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.

   a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes or tab-type reinforcement.
   b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.

B. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.

1. Provide continuity with masonry joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.

C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide individual metal ties not more than 16 inches o.c.

3.7 MASONRY JOINT REINFORCING

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

C. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 07 Section "Joint Sealants," but not less than 3/8 inch.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

D. Provide vertical expansion, control and isolation joints in masonry at junction to existing masonry, where shown and required, but not to exceed 28'-0" spacing within 10 feet of one side of a corner, at wall offsets, at changes in wall height and directly below shelf angles. Build in related masonry accessory items as the masonry work progresses.

E. Build in flanges of factory fabricated expansion joint units furnished by others. Joint width for sealants 3/8", unless otherwise indicated.

F. Provide approved rated expansion joints and/or joints at joints within and between firewalls and intersecting/abutting walls including other rated walls and other required rated walls.

3.9 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.10 PARGING

A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.

C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.11 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
7. Clean stone trim to comply with stone supplier's written instructions.
8. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.12 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste.
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

PART 1 - SECTION 055000 – METAL FABRICATIONS

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 DESCRIPTION OF WORK

A. Provide all plant, labor, materials, accessories, equipment and incidentals to complete Miscellaneous Metals work, as shown, specified, and as required, including, but not necessarily limited to, the following:

1. Metal fabrications include items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not part of structural steel or other metal systems specified elsewhere shall be provided and installed by the Contractor.
2. Rough hardware
3. Loose bearing and leveling plates, loose steel lintels, plates, bars, angles, etc.
4. Downspout Boots
5. Miscellaneous fabrications as noted and/or required to properly complete the project.
6. Miscellaneous framing and supports to support other work including mechanical and electrical equipment and other applications where framing and supports are not specified in other sections provided and installed by the Contractor.
7. Downspout Boots provided and installed by the General Contractor.

B. Related work specified elsewhere:

1.	Concrete Work	Division 03
2.	Unit Masonry	Division 04
3.	Hollow Metal Doors and Frames	Division 08
4.	Painting	Division 09

1.3 QUALITY ASSURANCE

A. Codes and Standards: Comply with the provisions of the following, except as other-wise indicated:

1. IBC International Building Code 2009, New Jersey Edition
2. AISC "Manual of Steel Construction".
3. AWS Structural Welding Codes
4. ANSI A14.3 “Safety Requirements for Fixed Ladders”
5. NAAMM “Metal Bar Grating Manual”.

B. Qualifications for welding work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

1. If re-certification of welders is required, retesting will be Contractors responsibility.

C. Welding: Use qualified welders and comply with American Welding Society (AWS) DI.1, “Structural Welding Code – Steel”, (AWS) DI.3, “Structural Welding Code – Sheet Steel”.

D. Be responsible for interface coordination between work provided and related work of other trades and contracts.

E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, anchor details, installation and application instructions for metal products, fabrications, accessories and primer paint used in miscellaneous metal fabrications, including paint products and grout.

B. Shop Drawings: Submit shop drawings showing complete details and schedules for fabrication and erection. Include plans, elevations, details of sections, connections, anchorage, accessory items and material properties. Provide templates and setting drawings. Provide signed and sealed engineered calculations by a Professional Engineer licensed in the State of New Jersey for materials and fabrications required to comply with design loads. Indicate all adjacent work to which the fabrications are attached or with which components must interface.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site at such intervals to insure uninterrupted progress of the work.

B. Store materials to permit easy access for inspection and identification. Keep metals inside a well-ventilated area off the ground, using pallets, platforms, or other supports. Protect metal members and packaged materials from corrosion and deterioration.

1.6 PROJECT CONDITIONS

A. Field Measurements: Where miscellaneous metal work is indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating miscellaneous metal work without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, stains, discoloration, rolled trade names, roughness and other imperfections.

B. Steel Plates, Shapes and Bars: ASTM A36/A36M.

C. Steel Bar Grating: ASTM A569 or ASTM A36.

D. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

E. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, and shims as required, hot-dip galvanized, ASTM A 153.

F. Cast-In Place and Post-installed Anchors: Anchors of type indicated and as required, fabricated from corrosion-resistant materials, capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified, independent testing agency.

G. Grout:

1. Metallic Non-Shrink Grout: Pre-mixed, factory-packaged, ferrous aggregate grout in accordance with CE CRD-C588, Type M and ASTM C 1107. Provide grout specifically recommended by manufacturer for heavy-duty loading applications.
2. Non-Shrink, Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non gaseous grout complying with CE CRD C621 and ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications of types specified herein.

H. Fasteners:

1. General: Provide zinc-coated fasteners for exterior or where built into exterior walls.
2. Hex-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563; and where indicated, flat washers.
3. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
4. Wood Screws: Flat head carbon steel, ASME B18.6.1.
5. Anchor Bolts: ASTM F1554, Grade 36.
6. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
7. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M).
8. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.22.2M).
9. Toggle Bolts: Tumble-wing type, class and style as needed, FS FF-B-588.

10. Masonry Anchorage Devices: Expansion shields FS FF-S-325.

I. Welding Rods and Bare Electrodes and Filler Material: Provide type and alloy of filler metal and electrodes according to AWS specifications for metal alloy welded and as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

J. Materials for Miscellaneous Steel: For the fabrication of miscellaneous metal work items which will be exposed to view, use only materials which are smooth and free of surface blemishes, including pitting, seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.

K. Paint:

1. Primer selected to be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Section 099000.
2. Shop Primer for Ferrous Metal: Organic zinc-rich primer, complying with SSPC-Paint 20 and compatible with topcoat.
3. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in steel, complying with SSPC-Paint 20.
4. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION

A. Workmanship: Use of materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for various components or work.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise shown. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

C. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-heat (countersunk) screws or bolts. Use fasteners of same basic metal as fastened metal unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

E. Provide for anchorage of type indicated and as required, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

F. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive hardware and similar items.

G. Fabricate joints that will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

H. Electrodes for Welding: Comply with AWS Code and as recommended by product manufacturer.

I. Rough Hardware: Furnish bent or otherwise custom fabricated bolts, plates, inserts, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing, supporting, anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 - Sections.

J. Fabricate items to sizes, and shapes and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections; elsewhere, furnish steel washers.

K. Loose Bearing and Leveling Plates: Furnish and install loose bearing and leveling plates for steel items bearing on masonry or concrete constructions, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting required. Galvanize after fabrication.

L. Fabricate miscellaneous units to sizes, shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise indicated, fabricate from structural steel shapes and plates and steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

M. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

N. Except as otherwise shown, space anchors 24” o.c. and provide minimum anchor units of 1-1/4” x 1/4” x 8” steel straps.

O. Galvanize all exterior miscellaneous frames, supports and trim. All interior miscellaneous frames, supports and trim at wet and high humidity areas and as otherwise indicated.

P. Galvanizing:

1. Provide a zinc coating for those items indicated or specified to galvanized, as follows: Unit noted to be galvanized are to be hot dipped galvanized after fabrication.

    a. ASTM A 153 for galvanizing iron and steel hardware.
    b. ASTM A 123 for galvanizing rolled, pressed, and forged steel shapes, plates, bars, and strip 1/8" thick and heavier.
    c. ASTM A 386 for galvanizing assembled steel products.

2.3 COATINGS AND PRIMER PAINTS

A. Shop paint miscellaneous metal work, except members or portions of members to be embedded in concrete, masonry and surfaces and edges to be field welded, galvanized or finished metal surfaces unless otherwise indicated.

B. Remove scale, rust and other deleterious materials before applying shop coat. Clean off heavy rust and loose mill scale in accordance with SSPC SP-2 (Hand Tool Cleaning), SSPC SP-3 (Power Tool Cleaning) or SSPC SP-6 (Commercial Blast Cleaning). Omit blast cleaning for interior work.

C. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 (Solvent Cleaning).

D. Apply one shop coat to fabricated metal items, except apply 2 coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

E. Exterior Steel Items: Hot dipped galvanized to receive finish coats; ASTM A 153, A123, and A386, unless otherwise noted.

F. Galvanized coating repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780. SSPC P-20 or Mil-P-21D3T.

PART 3 - EXECUTION

3.1 INSPECTION

A. Installer must examine the areas and conditions under which work is to be installed and notify the General Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the erector.

3.2 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.3 INSTALLATION

A. Install miscellaneous metals in accordance with referenced standards and as shown on final approved shop drawings.

B. Install manufactured products in conformance with manufacturer's recommendations.

C. Fastening to In-Place Construction:

1. Except as otherwise specified, provide anchorage devices and fasteners where necessary for securing metal fabrication items to in place construction including threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, lag bolts, and other connectors as required.

D. Cutting, Fitting and Placement:

1. Perform cutting, drilling and fitting required for the installation of the miscellaneous metal items. Set the work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in form work for items which are to be built into concrete, masonry or similar construction.
2. Fit exposed connections accurately together to form tight hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of units and components which are zinc coated, shop prime painted, or finish after fabrication or are intended for mechanical field connections or other means without further cutting or fitting.

E. Field Welding:

1. Comply with AWS Code for the procedures of manual shielded metal arc welding, the appearance and quality for welds made, and the methods used in correcting welding work. Use materials and methods that minimize distortion, develop strength, and corrosion resistance to base metals without undercut or overlap. Finish surfaces shall be left smooth and match contours of adjoining surfaces.

3.4 ADJUSTING, CLEANING AND PROTECTION

A. Immediately after erection of steel items, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. For galvanized surfaces: Clean field welds, bolted connections and abraded areas and apply 2 coats of galvanizing repair paint.

C. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 055010

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Wood furring.
3. Plywood backing panels.

B. Related Requirements:

1. Section 061600 "Sheathing."
2. Division 7 for Siding Materials.

1.3 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. RIS: Redwood Inspection Service.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. 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.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Power-driven fasteners.
3. Powder-actuated fasteners.
4. Expansion anchors.
5. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency

certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

C. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by a manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Category UC3b for exterior construction not in contact with the ground, and Category UC4a for items in contact with the 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 a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Furring.
3. Utility shelving.

B. For utility shelving, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Spruce-pine-fir (south) or spruce-pine-fir; Select Merchantable or No. 1 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.4 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

1. Plywood 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."

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A ; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.6 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Cleveland Steel Specialty Co.
2. KC Metals Products, Inc.
3. Phoenix Metal Products, Inc.
4. Simpson Strong-Tie Co., Inc.
5. USP Structural Connectors.

C. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated on drawings. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

D. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

E. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

F. Bridging: Rigid, V-section, nailless type, 0.050 inch thick, length to suit joist size and spacing.

G. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch above base and with 2-inch minimum side cover, socket 0.062 inch thick, and standoff and adjustment plates 0.108 inch thick.

H. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 2-1/4 inches wide by 0.062 inch thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.

I. Floor-to-Floor Ties: Flat straps, with holes for fasteners, for tying upper floor wall studs to band joists and lower floor studs, 1-1/4 inches wide by 0.050 inch thick by 36 inches long.

2.7 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

D. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

F. Do not splice structural members between supports unless otherwise indicated.

G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

H. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Comply with approved fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal size furring vertically at 16 inches o.c.

C. Furring to Receive Gypsum Board or Plaster Lath: Install 1-by-2-inch nominal size furring vertically at 16 inches o.c.

3.4 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

A. Provide all labor, materials, accessories, equipment, and incidentals to complete building sheathing, as shown and/or specified including, but not necessarily limited to, the following:

1. Wall sheathing.
2. Roof sheathing.
3. Sheathing joint and penetration treatment.

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For following products, from ICC-ES:

1. Preservative-treated plywood.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

1. Plywood.

B. Oriented Strand Board: DOC PS 2.

C. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

D. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.3 WALL SHEATHING

A. Plywood Wall Sheathing: Exterior sheathing.

1. Span Rating: Not less than 16/0.
2. Nominal Thickness: Not less than 1/2 inch.

2.4 ROOF SHEATHING

A. Plywood Roof Sheathing: Exterior sheathing.

1. Span Rating: Not less than 16/0.
2. Nominal Thickness: Not less than 1/2 inch.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall sheathing, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For dry-wall type non-load nearing steel framing: For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
2. For load bearing cold –formed metal framing: For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

2.6 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Paper-Surfaced Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 079200 "Joint Sealants."

2.7 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Wall and Roof Sheathing:

a. Nail or staple to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
b. Screw to cold-formed metal framing.
c. Space panels 1/8 inch apart at edges and ends.

2. Underlayment:

a. Nail or staple to subflooring.
b. Space panels 1/32 inch apart at edges and ends.

END OF SECTION 061600

SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

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. Wood roof trusses.

1.3 DEFINITIONS

A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.

B. Shop Drawings: Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
6. Show splice details and bearing details.

C. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer, licensed in the State of New Jersey, responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum specific gravity. Indicate species and grade selected for each use and specific gravity.

B. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss-fabricating firm.

C. Evaluation Reports: For the following, from ICC-ES:

1. Metal-plate connectors.
2. Metal truss accessories.

1.6 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.

2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program, complies with quality-control procedures in TPI 1, and involves third-party inspection by an independent testing and inspecting agency acceptable to Architect.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations in SBCA 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.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal-plate-connected wood trusses.

B. Structural Performance: Metal-plate-connected wood trusses shall be capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.

1. Design Loads: As indicated.
2. Maximum Deflection under Design Loads:

    a. Roof Trusses: Vertical deflection of 1/240 of span.

C. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.

D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.2 DIMENSION LUMBER

A. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (ALSC) Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Provide dressed lumber, S4S.

B. Minimum Chord Size for Roof Trusses: 2 by 6 inches nominal for both top and bottom chords.

2.3 METAL CONNECTOR PLATES

A. General: Fabricate connector plates to comply with TPI 1.

B. Hot-Dip Galvanized-Steel Sheet: ASTM A 653; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.

B. Nails, Brads, and Staples: ASTM F 1667.

2.5 METAL FRAMING ANCHORS AND ACCESSORIES

A. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653, G60 coating designation.

B. Truss Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening roof trusses to wall below, 2-1/4 inches wide by 0.062 inch thick. Tie fits over top of truss and fastens to both sides of truss and top plates.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 92 percent zinc dust by weight.

2.7 FABRICATION

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.

B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.

C. 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. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

2. Coordinate minimum space required between structural members to accommodate ductwork, piping, and all other miscellaneous building infrastructure as indicated or required by design documents.

D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

2.8 SOURCE QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections.

B. Correct deficiencies in Work that special inspections indicate do not comply with the Contract Documents.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.

G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.

H. Securely connect each truss ply required for forming built-up girder trusses.

I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

J. Install wood trusses within installation tolerances in TPI 1.

K. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.

L. Replace wood trusses that are damaged or do not comply with requirements.

1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified professional engineer responsible for truss design, when approved by Architect.

3.2 REPAIRS AND PROTECTION

A. Protect wood trusses from weather. If, despite protection, wood trusses become wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Repair damaged galvanized coatings on exposed surfaces according to ASTM A 780 and manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections to verify that temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package.

END OF SECTION 061753

SECTION 062013 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Exterior cellular PVC (Composite) trim.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

B. Samples for Verification: For each type of product involving selection of colors, profiles, or textures.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For manufacturer's warranties.

1.5 QUALITY ASSURANCE

A. Allowable Tolerances:

1. Variation in component length: -0.00 / +1.00”
2. Variation in component width: ± 1/16”
3. Variation in component thickness: ± 1/16”
4. Variation in component edge cut: ± 2°
5. Variation in Density -0% + 10%

B. Workmanship, Finish, and Appearance:

1. Free foam cellular PVC that is homogeneous and free of voids, holes, cracks, and foreign inclusions and other defects. Edges must be square and top and bottom surfaces shall be flat with no convex or concave deviation.
2. Uniform surface free from cupping, warping, and twisting.

1.6 DELIVERY, STORAGE AND HANDLING

A. Trim materials should be stored on a flat and level surface on a full shipping pallet. Handle materials to prevent damage to product edges and corners. Store materials under a protective covering to prevent jobsite dirt and residue from collecting on the boards.

1.7 WARRANTY

A. Manufacturer's Warranty for Cellular PVC Trim: Manufacturer agrees to repair or replace trim that fails due to defects in manufacturing within specified warranty period. Failures include, but are not limited to, deterioration, delamination, and excessive swelling from moisture.

1. Warranty Period: 25 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXTERIOR TRIM

A. Cellular PVC (Composite) Trim: Extruded, expanded PVC with a small-cell microstructure, recommended by manufacturer for exterior use, made from UV- and heat-stabilized, rigid material.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. CertainTeed Corporation (Basis of Design).
   b. Azek Building products.
   c. Approved equivalent.

2. Density: Not less than 31 lb/cu. ft.
3. Heat Deflection Temperature: Not less than 130 deg F, according to ASTM D 648.
4. Water Absorption: Not more than 1 percent, according to ASTM D 570.
5. Flame-Spread Index: 75 or less, according to ASTM E 84.
6. Finish: Smooth finish.

2.2 MISCELLANEOUS MATERIALS

A. Adhesive and Fasteners for Cellular PVC Trim: Product recommended by trim manufacturer.

B. Flashing: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.

PART 3 - EXECUTION

A. Install cellular PVC trim to comply with manufacturer's written instructions.

B. Install trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long except where necessary.

1. Use scarf joints for end-to-end joints.
2. Stagger end joints in adjacent and related members.

C. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

D. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

3.2 ADJUSTING

A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.3 CLEANING

A. Clean exterior finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062013

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Glass-fiber blanket sound insulation.
2. Extruded polystyrene foam-plastic board.
3. Polyisocyanurate foam-plastic board.
4. Composite polyisocyanurate foam-plastic board panel.
5. Mineral-wool blanket.
6. Insulation fasteners and accessories.

B. Related Requirements:

1. Section 042000 "Unit Masonry" for insulation installed in masonry cells.
2. Section 061600 "Sheathing" for foam-plastic board sheathing installed directly over wood or steel framing.
3. Section 092116 “Gypsum Board Assemblies” for sound attenuation batts for interior partitions.
4. Division 22 for Plumbing insulation(s).
5. Division 23 for Mechanical duct and piping insulation(s).

1.3 DEFINITIONS

A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.4 PERFORMANCE REQUIREMENTS

A. Plenum Ratings: Where indicated provide glass-fiber insulation in ceiling plenums whose test performance is rated for use in plenums as determined by testing product(s) per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.

B. Mold Growth and Humidity Test Results: Provide insulation showing no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity after inoculation

with Chaetomium Globosium on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.7 QUALITY ASSURANCE

A. Fire Performance: Provide insulation materials matching those whose indicated fire performance characteristics have been determined per ASTM test methods indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.

1. ASTM E 84 Surface Burning Characteristics
2. ASTM E 119 Fire Resistance Ratings
3. ASTM E 136 Combustion Characteristics

B. Provide insulations composed of mineral fibers or mineral ores which contain no asbestos, of any type or mixture of types occurring naturally as impurities, as determined by polarized light microscopy test per appendix of 40 CFR 73.

C. Recycled Content: Provide glass-fiber insulation with recycled content so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than (25) percent.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

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 or approved equal.

a. CertainTeed Corporation.
b. Guardian Fiberglass, Inc.
c. Johns Manville.
d. Knauf Fiber Glass.
e. Owens Corning.

2.2 GLASS-FIBER BLANKET INSULATION

A. Unfaced, Glass-Fiber Blanket Insulation (Above Ceilings): ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread rating 25, smoke-developed rating 450 or less, passing ASTM E 136 for combustion characteristics.

B. Faced, Glass-Fiber Blanket Insulation (Exterior Walls, Roof): ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with (foil-scrim-kraft) vapor-retarder membrane on 1 face.

C. Where glass-fiber blanket insulation is indicated by the following thicknesses, or if not indicated, to fill stud or joist depth, provide blankets in batt or roll form with thermal resistances indicated:

1. 3-1/2 inches (89 mm) thick with a thermal resistance of 13 deg F x h x sq. ft./Btu at 75 deg F (2.3 K x sq. m/W at 24 deg C).
2. 3-5/8 inches (92 mm) thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F (1.9 K x sq. m/W at 24 deg C).
3. 5-1/2 inches (140 mm) thick with a thermal resistance of 19 deg F x h x sq. ft./Btu at 75 deg F (3.3 K x sq. m/W at 24 deg C).
4. 6-1/2 inches (165 mm) thick with a thermal resistance of 21 deg F x h x sq. ft./Btu at 75 deg F (3.7 K x sq. m/W at 24 deg C).
5. 9-1/2 inches (241 mm) thick with a thermal resistance of 30 deg F x h x sq. ft./Btu at 75 deg F (5.2 K x sq. m/W at 24 deg C).

D. Sound Attenuation Batts - Unfaced, Glass-Fiber Blanket Insulation ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread rating 25, smoke-developed rating 450 or less, passing ASTM E 136 for combustion characteristics.

1. Where sound attenuation insulation is indicated by the following thicknesses, provide blankets in batt or roll form with noise reduction criteria indicated:

    a. Installed within stud cavity with NRC of 1.00.

2.3 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.

B. Extruded Polystyrene Board, Type IV: ASTM C 578, Type IV, 25-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.

1. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. DiversiFoam Products.
    b. Dow Chemical Company (The).
    c. Owens Corning.
    d. Pactiv Corporation.
    e. Or equivalent

2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

3. Use: Below slab-on-grade or any other below grade application where insulation is exposed to ground moisture.

4. Install 2” thick Extruded Polystyrene Board insulation per the following unless otherwise indicated on the drawings:

    a. Slabs-on-Grade: 24” in from face of foundation walls.
    b. Foundation Walls: min. 24” down from underside of slab-on-grade.

2.4 POLYISOCYANURATE FOAM-PLASTIC BOARD

A. Polyisocyanurate Board, Foil Faced: ASTM C 1289, foil faced, Type I, Class 1 or 2.

1. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Atlas Roofing Corporation.
    b. Dow Chemical Company (The).
    c. Hunter Panels.
    d. Rmax, Inc.

e. Or equivalent.

2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

3. Use: Above grade cavity wall insulation.

2.5 COMPOSITE POLYISOCYANURATE FOAM-PLASTIC BOARD PANEL

A. Polyisocyanurate Board laminated to 3/4" plywood substrate: ASTM C 1289, Type V, Class 2.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the following, or comparable product by one of the following:

a. Hunter Panels, Xci Ply.
b. Or equivalent

2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

3. Use: Above grade cavity wall insulation where substrates are required for fastening of cladding materials.

4. Provide 3/4" exterior grade (preservative-treated) plywood at all locations of roof and wall sheathing.

5. Panels shall be fastened to substrate in compliance with manufacturer’s recommended spacing and fasteners.

2.6 MINERAL-WOOL BLANKETS

A. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Industrial Insulation Group, LLC (IIG-LLC).
b. Roxul Inc.
c. Thermafiber Inc.; an Owens Corning company.

2.7 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.

B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.

1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:

a. Ceiling plenums.
b. Attic spaces.

C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

2.8 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

C. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturers for sealing joints and penetrations in vapor-retarder facings.

PART 3 - EXECUTION

3.1 INSPECTION

A. Installer must examine substrate and conditions, under which insulation work is to be performed and must notify Contractor in writing of unsatisfactory conditions.

B. Do not proceed with insulation work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

3.2 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

E. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

3.4 INSTALLATION OF SLAB INSULATION

A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation down to top of footing.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 24 inches in from exterior walls.

C. Protect top surface of horizontal insulation from damage during concrete work by applying protection course with joints butted.

3.5 INSTALLATION OF FOUNDATION WALL INSULATION

A. Butt panels together for tight fit.

B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.

2. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or damp-proofing according to manufacturer's written instructions.

D. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection course with joints butted. Set in adhesive according to insulation manufacturer's written instructions.

3.6 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between foam-plastic insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Set vapor-retarder-faced units with vapor retarder to warm-in-winter side of construction, unless otherwise indicated.

1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

D. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures.
4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
5. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

E. Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where shown or where required to maintain thermal barrier. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

3.7 MINERAL WOOL OR OTHER SAFING INSULATION

A. Install Safing Insulation to fill gap between deck flutes and top of fire rated walls. Cut safing insulation wider than gap to be filled to ensure compression fit and seal joint between insulation and edges deck and wall with caulking approved by safing insulation manufacturer for this purpose. Leave no voids in completed insulation.

3.8 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072500 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Building wrap.
2. Flexible flashing.

B. Related Requirements:

1. Section 061600 "Sheathing" for sheathing joint and penetration treatment.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Chemical Company (The); Styrofoam Weathermate Plus Brand Housewrap.
b. DuPont (E. I. du Pont de Nemours and Company); Tyvek CommercialWrap.
c. Ludlow Coated Products; Barricade Building Wrap.
d. Pactiv, Inc.; GreenGuard Ultra Wrap.
e. Raven Industries Inc.; Fortress Pro Weather Protective Barrier.

2. Water-Vapor Permeance: Not less than 6 perms per ASTM E 96, Desiccant Method (Procedure A).

B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spun-bonded polyolefin to produce an overall thickness of not less than 0.025 inch.

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. DuPont (E. I. du Pont de Nemours and Company); DuPont Flashing Tape.
b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Butyl Self Adhered Flashing.
c. Protecto Wrap Company; BT-25 XL.
d. Raven Industries Inc.; Fortress Flashshield.

B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

C. Nails and Staples: ASTM F 1667.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.

B. Cover sheathing with water-resistive barrier as follows:

1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.

C. Building Wrap: Comply with manufacturer's written instructions.

1. Seal seams, edges, fasteners, and penetrations with tape.
2. Extend into jambs of openings and seal corners with tape.

3.2 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.

1. Prime substrates as recommended by flashing manufacturer.
2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
3. Lap flashing over water-resistive barrier at bottom and sides of openings.
4. Lap water-resistive barrier over flashing at heads of openings.
5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 072500

SECTION 074113 –METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

A. Provide all plant, labor, materials, accessories equipment and incidentals to complete preformed metal roofing system work as indicated and required for a complete watertight installation including, but not necessarily limited to the following:

1. Standing seam metal roof panel system, machined seam.
2. Eaves, edges, fascias, ridges, gables, rakes, side walls, associated trims, accessories, etc. associated with preformed metal roofing system.
3. All types of flashings associated with metal roofing panels.
4. Anchor clips, screws, concealed fasteners, closures, sealants.
5. Thermal board insulation.
6. Asphalt felt underlayment

B. Related Work Specified Elsewhere:

1. Miscellaneous Metals: Division 5.
2. Rough Carpentry: Division 6.
3. EPDM Membrane Roofing: Division 7.
4. Sheet Metal Flashing and Trim: Division 7.
5. Division 07 Section "Roof Specialties" for manufactured roof drainage systems, and other roof specialties not part of metal roof panel assemblies.
6. Joint Sealants: Division 7.

1.3 QUALITY ASSURANCE

A. Manufacturers requesting approval are subject to meeting or exceeding requirements of these specifications. Manufacturer shall have at least ten (10) years experience in manufactured structural preformed metal roofing systems. The metal roof panel system shall have been in use for at least ten (10) years on projects of similar type and exposure.

B. Manufacturer of the preformed metal roofing system will be one whom maintains an in house technical department with fully qualified Technical Representatives, other than the Installer, and who are available for technical assistance, including field assistance at the project site.

C. The Technical Representative will make all field inspections necessary, but not less than one final inspection to ascertain that the metal roof panel system has been installed in accordance with the manufacturer's specification, details and recommendations and for issuance of the warranty/guarantee. The Installer will be responsible for all costs relating to these services by a member of the manufacturer's field inspection forces.

D. Installer shall be a firm authorized by the metal roofing system manufacturer. The actual work shall be supervised by personnel trained by the manufacturer in proper application of the product(s) and acceptable to the Architect. The firm shall be capable of documenting not less than five (5) metal roofing projects, of similar size and complexity to those required for this project. The Installer shall have capability for preparation of shop details and fabrication of all flashings not furnished by the metal roof panel manufacturer.

E. Reference Standards. Current edition of each applies.

1. Aluminum Association - AA

   a. Specifications for Aluminum Sheet Metal Work in Building Construction
   b. Specifications for Aluminum Structures
   c. Standard and Data

2. National Roofing Contractors Association - NRCA

   a. Roofing and Waterproofing Manual

3. Sheet Metal and Air Conditioning Contractors National Association - SMACNA

   a. Architectural Sheet Metal Manual

4. American Society of Testing Materials – ASTM.

   a. B209: Aluminum Alloy Sheet and Plate
   b. D1056: Specification for Flexible Cellular Materials
   c. E330: Structural Performance by Static Air Pressure Difference
   d. E1592: Static Air Pressure Testing of Standing Seam Metal Roofing.
   e. E283: Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.
   f. E331: Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

F. All materials shall be approved and listed in UL Building Materials Directory, Roof Coverings Materials for a Class A roof covering, Class 1-90 rating.

1.4 PRODUCT TESTING AND PERFORMANCE REQUIREMENTS

A. Structural uniform load capacity shall be determined by testing in accord with the principles of ASTM E330 adapted to testing of formed sheet panels by clarifying specific sections of this standard as follows:

1. Roof test specimens shall be representative of the main body of the roof, free from influence of perimeter conditions. The setup shall be continuous over one or more supports and contain at least five panel widths.
2. Roofing panels and accessories are to be production material of the same type and thickness proposed for use on the project.
3. Longitudinal seals or plastic film shall not span any crevice or cracks that may tend to separate under pressure (e.g. plastic films used to seal the chamber must be applied into the side seam of the panel so as to apply a uniform static pressure to the entire cross section of the panel).
4. Design capacity for conditions of gauge, span or loading other than those tested may be determined by the interpolation of test results in accord with the Specifications For Aluminum Structures. Extrapolation outside the range of the tests is not acceptable. The system as installed shall carry an Underwriters Wind Uplift Class 90 rating in addition to and not in lieu of other performance criteria set forth by this specification.

B. Weather tightness: When tested in accord with the principles of AAMA - 501.1, the roof system without sealant in the ribs shall show no leakage when exposed to dynamic rain and wind velocity up to 70 mph for five minutes.

C. Resistance to wear through: An assembled specimen at least 3 panels wide spanning 3 or more supports with a 10 pound positive load on each clip shall be subjected to 100,000 cycles 1” in each direction for a total of 2” thermal movement. Upon completion, the panel shall show no signs of wear through from the top nor shall the contact surfaces between the clip and panel show any more than 25% loss in metal thickness. Laboratory test reports shall be independently certified (not by the manufacturer) by a registered professional engineer licensed to practice in the State of New Jersey.

D. Air Infiltration (ASTM E283): The result of testing in accordance with ASTM E283 shall be 0.02 cfm/sq.ft. at 6.24 psf (50 mph).

E. Water Infiltration (ASTM E331): The result of testing in accordance with ASTM E331 shall be “No Leakage at Seams” when tested at 15.0 psf (77 mph).

F. Factory color finish: The manufacturer shall have conducted tests on previously manufactured panels of the same type and finish as proposed for the project to assure conformance with these specifications. The term “appearance of base metal” refers to the aluminum under the organic coating. Panels shall pass the following tests:

1. Salt Spray Test: A sample of the panels shall withstand a salt spray test in accordance with ASTM B117, including the scribe requirement in the test. Duration shall be for a minimum of 3000 hours for aluminum. Immediately upon removal of the panel from the test, the coating shall receive a field blister rating of none (for aluminum) in accord with ASTM D714, and creepage from scribe of 1/32” (for aluminum).
2. Formability Test: When subjected to a scored T-Bend using impact wedge bend apparatus in accordance with ASTM D3281, exterior coating film shall show no cracking and no pick-off with Scotch 610 tape at 3-T bend prior to fracture of base metal.
3. Accelerated Weathering Test: A sample of the panels shall withstand a minimum of 2000 hours exposure in accordance with ASTM D822 with the following results: Chalk rating

of 8 to 10 (no chalk) per ASTM D659. Color change no greater than 2 delta E units per ASTM D2244.

4. Abrasion Resistance Test for Color Coating: In the Falling Sand test in accordance with ASTM D968, coefficient of abrasion shall be a minimum of 55 liters of sand per mil of coating thickness before appearance of base metal.
5. Humidity Test: When subjected to a humidity cabinet test in accordance with ASTM D2247 for 3000 hours, panels shall show no field blisters and no change in pencil hardness after 24 hours.

1.5 SUBMITTALS

A. Product Data: Submit specifications, installation instructions and general recommendations from manufacturer of metal roofing system. Include data substantiating that materials comply with requirements.

1. Submit copies of performance data on the panels, anchor clips, fasteners, and all accessories required for the work, material samples or mock-ups as required by the Architect.
2. Submit manufacturers' standard service guarantee and special guarantees comply with requirements specified with initial submittal.

B. Shop Drawings: Submit complete shop drawings in large scale showing roofing system configuration and sheet layout as referenced to structure and adjacent conditions, dimensions, type, size and spacing of fasteners, material thickness and finishes, details at perimeters, valley flashings, flashings, special conditions etc. Submit layout of snow guards. Submit plan with erection sequence and coordination required with other Trades.

C. Obtain manufacturer's approval of roofing system shop drawings prior to submittal to Architect.

D. Submit with the drawings: Copies of independent laboratory tests, mill certifications, and calculations by a professional engineer registered in the State of New Jersey certifying structural performance data on the panels, anchor clips, and fasteners to meet the structural testing and performance and materials requirements of this project. Manufacturer's certification letters will not be accepted in lieu of the specified independent laboratory tests, mill certifications, and calculations by a professional engineer registered in the State of New Jersey.

E. Samples for Approval:

1. Submit minimum 12" long by actual panel width samples of roofing system panels and flashing sheets.
2. Submit snow guard, clip, fastener, anchor, closures, battens, etc. and other accessories.
3. Sealant and seal tape: One sample at least 8 oz., with descriptive data.
4. Color sample to match Architect's color sample or as selected by the Architect from the manufacturer's full range of available colors.
5. Submit 12" square sample of required insulation board.

F. Submit description of manufacturer's final field inspection program, including description of training and experience of Technical Representatives. Submit written reports of all inspections

performed and quality control data certifying that materials furnished for the project are the same as those tested.

1.6 JOB CONDITIONS

A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of the work and protection of materials and finishes.

B. Weather: Proceed with metal roofing system work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturer's recommendations and warranty requirements.

1.7 STORAGE AND HANDLING

A. Provide protection during fabrication, shipment, storage and erection. Protect finished surfaces from abrasion with a removable plastic film between areas of contact. Store materials on site in a clean dry area out of direct contact with the ground under cover or sloped for drainage, protected from abuse and contamination by corrosive or staining materials. Secure material from wind damage before and during installation. Installed panels shall be protected from abuse by other Trades. Provide walk boards in heavy traffic areas and any other measures required to prevent damage from all Trades.

1.8 PROJECT WARRANTY

A. Prior to final acceptance, a final inspection will take place with representatives of the Owner, Architect, Roofer and Manufacturer present.

B. Furnish Owner with a TWO (2) year Contractor's Maintenance Bond from date of Final Acceptance covering all labor and material costs to repair defects, leaks, etc., occurring during that period. Bond to cover metal roof panels, flashings, etc.

C. Furnish Owner with Panel Manufacturers' 20-year warranty against structural defects, 20-year warranty on finish durability, 20-year weathertight warranty from date of final acceptance covering all labor and material costs to repair defects, leaks, etc. in metal roof panel system which occurs during that period.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

Series 300 as manufactured by Innovative Metals, Tucker, Ga.
SRS as manufactured by Steelite, Inc., Pittsburgh, PA
Zip-Rib roofing and siding as manufactured by Merchant & Evans, Inc., Burlington, NJ

2.2 PANEL MATERIALS

A. Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), alclad alloy 3003, 3004, or 3105 for painted finishes and alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

1. Alternative alloys include the following:

   a. Alclad Alloy 3003: H14, H16, H24, or H26 temper.
   b. Alclad Alloy 3004: H22, H24, H32, or H34 temper.
   c. Alloy 3105: H14 or H16 temper.
   d. Alloy 5005: H14, H16, H24, H26, H34, or H36 temper.

2. Surface: Smooth, flat finish.
3. Exposed Finishes: Apply the following coating, as specified or indicated on Drawings.

   a. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

      1) Fluoropolymer Three-Coat System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight, with a minimum total dry film thickness of 1.5 mil (0.038 mm); complying with AAMA 2605.

   b. Plastisol: Epoxy primer and vinyl plastisol topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 3.8 mil (0.97 mm) for topcoat.

4. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.3 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be field assembled by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1637.

B. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, and snapping panels together.

1. Basis-of-Design Product:
   a. Snap-Clad Panel, standing seam metal roofing, as manufactured by PAC-CLAD / Petersen Aluminum Corporation.
   b. UNA-CLAD UC-4 1-1/2" high Architectural Standing Seam panel, as manufacture red by Firestone / UNA-CLAD.
   c. or a comparable product of one of the following manufacturers:

      1) ATAS International, Inc.
      2) Berridge Manufacturing Company.
      3) CENTRIA Architectural Systems.
      4) Delcoa Industries, Inc.
      5) Fabral, Inc.
      6) Innovative Metals Company, Inc.
      7) MBCI; Div. of NCI Building Systems.
      8) McElroy Metal, Inc.
      9) Merchant & Evans, Inc.
      10) Metal-Fab Manufacturing, LLC.
      11) Modern Metal Systems, Inc.
      12) Perma-Clad Products.

2. Material: Aluminum sheet, 0.040 inch (1.0 mm) thick.

   a. Exterior Finish: Fluoropolymer.
   b. Color: "Award Blue"

3. Batten: Same material, finish, and color as roof panels.
4. Clips: Fixed.

   a. Material: 0.0528-inch- (1.35-mm-) thick, zinc-coated (galvanized) steel sheet.

5. Panel Coverage: 12 inches (305 mm)
6. Panel Height: 1.75 inches
7. Uplift Rating: UL 90.

2.4 ACCESSORY MATERIALS

A. Anchor clips shall be non-magnetic stainless steel with galvanized steel base. Fasteners in supports and screws installed in clips shall be fully recessed so that no sharp edges come in

contact with the roof material. Clips are to be designed to allow for expansion and contraction of the roof panels and components relative to the structure throughout.

B. Screws holding anchor clips to the structure shall be stainless steel into wood or stainless steel cadmium plated self-tapping screws into predrilled holes into steel.

C. Concealed fasteners shall be used to the fullest extent possible with inside coverplates. Fasteners shall be aluminum or stainless steel. Screws shall have separate washers with hot bonded neoprene faces, and pop rivets shall be set in wet sealant for weather tightness. Fasteners shall be a minimum #14 size screw or 3/16" diameter rivet. Locate and space fasteners in true vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.

D. Precut foam profile closures shall be black closed cell foam meeting ASTM D1056 grade SCE-41 Black EPT. Field fabricate hip closures with foam PVC, supported and protected from weathering by metal channel matching the finish of roof flashing.

E. Sealant shall be applied between surfaces during assembly with a minimum amount being exposed on the completed installation.

1. Concealed sealant may be non-curing, non-skinning butyl, polyisobutylene or polybutane tape of sufficient thickness to make full contact with both surfaces.
2. Exposed sealant curing type with excellent weather and U.V. resistance. Color as selected by Architect. Apply sealant in accordance with manufacturer's recommendation.

F. Apply bituminous coating or other permanent separation materials on concealed panel surfaces where panels would otherwise be in direct contact with substrate materials that noncompatible or could result in corrosion or deterioration of either material or finishes.

G. Polyisocyanurate Board Insulation: Unfaced, preformed, rigid, cellular polyisocyanurate thermal insulation complying with ASTM C 591, Type 2 with aged thermal-resistance values for 1-inch thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F (1.1 K x sq. m/W at 24 deg c). R = 19 at 2.6" thickness.

H. Roof Underlayment shall be provided under all roofing panels and shall be a water repellent material that conforms to ASTM D 226 or ASTM D 1970, Type 30 (asphalt rag felt) or approved equal. Underlayment shall be installed in accordance with the manufacturer's recommendations and shall provide a continuous, unbroken weather seal underneath panels and around penetrations, etc.

I. Soffit: PAC-750 Soffit System, or approved equal.

1. Material Thickness: .032 inch aluminum
2. Width: 12 inches
3. Height: 1/2 inch
4. Profile: Half-vent
5. Color: Award Blue
6. Provide matching J trim and other accessories for a complete installation.

2.5 FABRICATION

A. Minimum inside bend radius on flashing shall be 3T, and all edges shall have an open hem for stiffness.

B. Attachment screws to be eliminated in favor of concealed cleats or clips wherever possible.

C. Pan end all panels.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Prior to installation, verify that the structure is ready to receive this work. Field check and verify dimensions alignment of structural members and integrity of substrate system to assure that panels and flashing are straight and true. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer. Beginning installation work will be taken as approval of substrate conditions by roof panel installer.

B. Install work in accordance with manufacturer's instructions, approved shop drawings and under direct supervision of a technical representative authorized by the manufacturer of the roofing panel system. Anchor panels and other components of the work securely in place allowing for expansion and contraction from temperature changes without distortion or elongation of fastener holes. Install flashing in strict accordance with AA, NRCA and SMACNA architectural sheet metal manuals: without fasteners in end laps and isolation from dissimilar materials.

1. Field cutting of panels by torch is prohibited.
2. Install panels with concealed fasteners.

C. Install components required for a complete roofing panel system, including trim, corner units, ridge closures, knee joint trim, drip edges, clips, seam covers, mullions, sills, battens, flashings, sealants, gaskets, fillers, closure strips and similar, and all required items to complete the work.

D. Work shall be plumb and true, free of scrapes and dents. Panel ribs shall be on the module indicated in contract drawings within the tolerance allowed by actual construction dimensions. Remove excess sealant and apply touch-up paint to any areas where paint scrapes occur. Panels which are found to be damaged in the judgment of the Architect shall be removed and replaced.

E. Install gaskets, joint fillers, closures, and sealants where indicated and required for weatherproofing of system. Provide types of gaskets, closures, sealants and fillers as recommended by panel manufacturer and where recommended by panel manufacturer.

F. Installation to be designed to safely resist positive and negative loads in conformance with best industry standards.

G. Roofing system panels shall be able to support walking loads without excessive distortion or telegraphing of structural supports. Based on maximum span of project, panels shall withstand a 250 lb. concentrated load applied to a 4 square inch pad located at the center of the panel flat without buckling of the rib or noticeable permanent distortion of the panel.

H. Standing Seam Roofing Panel System: Fasten roofing panels to supports with concealed clips in accordance with the manufacturer's instructions.

1. Install clips at each support with self-drilling/self-tapping fasteners.

I. Seaming: Complete seaming of panel joints by operation of portable power-driven equipment of type recommended by panel manufacturer to provide a weathertight joint.

J. Panel and flashing attachments shall be designed to accommodate the thermal expansion and contraction of the exterior material.

K. Factors of safety on design loads to ultimate strength of fasteners shall be as stated in the industry, standard for the material into which the fastener is driven.

L. Cleaning: Remove temporary protective coverings and strippable films (if any) as soon as each panel is installed. Upon completion of panel installation, clean finished surfaces as recommended by panel manufacturer, and maintain in a clean condition during construction.

END OF SECTION 074113

SECTION 074646 - FIBER-CEMENT SIDING

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 fiber-cement siding

B. Related Requirements:

1. Section 0612013 "Exterior Finish Carpentry" for exterior cellular PVC trim.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For fiber-cement siding including related accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Product test reports.

C. Research/evaluation reports.

D. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.

1. Warranty Period for lap siding and shingle siding products: 30 years from date of Substantial Completion.

2. Finish Warranty: Limited product warranty against manufacturing finish defects, for a period of 15 years from the date of purchase: will not peel; will not crack; and will not chip. Finish warranty includes the coverage for labor and material.

3. Workmanship Warranty: Application limited warranty for 2 years

PART 2 - PRODUCTS

2.1 FIBER-CEMENT SIDING

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.

B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.

C. Nominal Thickness: Not less than 1/4 inch.

D. Subject to compliance with requirements, manufacturers of products that may be incorporated in the work include, but are not limited to, the following, or approved equal:

1. Basis of Design: Hardie Plank/ Hardie Panel, by James Hardie, or equivalent.

E. Type 2: Horizontal Plank (lap) Siding: Boards 7.25 inches wide.

1. Texture: Select Smooth

2. Exposure: 7 inches.

3. Color: Light Mist

F. Type 3: Vertical Siding: 5/16” thick.

1. Texture: Select Smooth

2. Size: 4ft x 10ft

3. Color: Light Mist

G. Battens: Batten Boards, .75” thick by 2.5” inches wide.

1. Texture: Smooth

2. Color: Light Mist

H. Soffit Panels: .25” thick, vented.

1. Texture: Smooth

2. Color: Light Mist

I. Type 1: Vertical Siding: 5/16” thick.

1. Texture: Sierra 8

2. Size: 6in wide

3. Color: Light Mist

J. Running Trim: 5/4 thickness, in widths as indicated on drawings.

1. Texture: Smooth

2. Color: Arctic White

K. Factory Priming: Manufacturer's standard acrylic primer.

L. Factory Finishing: Manufacturer’s shop applied, baked-on, UV resistant color finish. Provide caulk and touch-up paint to match color of adjacent trim boards.

1. Provide manufacturer’s 15-year limited warranty that covers paint and labor, protecting against peeling, cracking, and chipping.

2.2 ACCESSORIES

A. Flashing: Provide aluminum flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.

1. Finish for Aluminum Flashing: High-performance organic finish or Factory-prime coating to match siding and trim.

B. Fasteners:

1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch into substrate.
2. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch, or three screw-threads, into substrate.
3. For fastening fiber cement, use hot-dip galvanized fasteners.

C. Insect Screening for Soffit Vents: Aluminum, 18-by-16 mesh or PVC-coated, glass-fiber fabric, 18-by-14 or 18-by-16 mesh.

D. Continuous Soffit Vents: Aluminum, 2” hat-channel shape.

1. Net-Free Area: 6 sq. in./linear ft.
2. Finish: White paint.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

1. Install fasteners no more than 24 inches o.c.

B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

3.2 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074646

SECTION 076200 – SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

A. Provide all labor, materials, accessories, equipment and incidentals necessary to complete sheet metal flashings and trim work as indicated and required. The types of work covered in this section include, but are not limited to, the following:

1. Gutters and Downspouts.
2. Exposed Trims, Gravel Stops, Fascias, Edging, Copings, etc.
3. Metal Flashings and Counter Flashings.
4. Miscellaneous Sheet Metal Accessories.
5. All other Sheet Metal, Flashing and Trim indicated or required elsewhere, not specifically specified herein or in other work.

B. Related Sections:

1. Division 07 Section "Asphalt Roofing Shingles" for roof underlayment and Water and Ice shield materials.

1.3 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. FM Approvals' Listing: Manufacture and install roof-edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification. Identify materials with FM Approvals' markings. Wind Load: Total roof system installation, including Sheet Metal Flashing and Trim Work, shall be in conformance with FM 4450, FM 4470, UL 580 or UL 1890.

C. Fabricate and install roof edge flashing and copings capable of resisting forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 applicable to the Project site location.

D. SPRI Wind Design Standard: Manufacture and install roof-edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressures:

1. Design Pressure: Per IBC-2009

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

F. Comply with Applicable Requirements of the following:

1. Class 1-90 Rating: Provide Roof Specialties Work in conformance with Class 1-90 requirements and coordinated with built-up roofing system and component materials which have been evaluated by an accredited test laboratory to have a Class 1-90 rating.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's material and finish data, product specifications, installation instructions and general recommendations for each specified sheet and flashing material and fabricated product.

B. Shop Drawings: Show installation layouts of sheet metal flashing and trim, including plans, elevations, profiles, expansion-joint systems and locations, anchoring methods, keyed details, relationships to adjacent construction and materials, etc. Distinguish between shop- and field-assembled work.

1. Include details for forming, joining, supporting, and securing sheet metal flashing and trim, including pattern of seams, termination points, fixed points, expansion joints, expansion-joint covers, edge conditions, special conditions, and connections to adjoining work.

C. Samples: Of the following products, in manufacturer’s standard sizes, in the finish specified, showing the full range of color, texture, and pattern variations expected. Prepare Samples from the same material to be used for the Work. Furnish straight Samples in lengths specified below or where corner pieces are required for Project; furnish corner Samples with each leg in lengths specified below:

1. Gutters and Downspouts: 8 inches long, including liners, screens, straps, hangers, and other support and attachment devices.
2. Counterflashing: 8 inches long.

A. Qualification Data: For qualified fabricator.

B. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

1.5 QUALITY ASSURANCES

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

C. SMACNA AND NRCA DETAILS: Conform work with details shown, and with fabrication requirements of “Architectural Sheet Metal Manual” by SMACNA. Comply with installation details of “Roofing and Waterproofing Manual” by NRCA.

D. NRCA “Roofing and Waterproofing Manual”, current edition. Material and installation specifications published by the insulation and membrane manufacturers.

E. Class 1-90 Rating: Provide Sheet Metal Flashing and Trim Work in conformance with Class 1-90 requirements and coordinated with built-up roofing system and component materials which have been evaluated by an accredited test laboratory to have a Class 1-90 rating.

F. Wind Load: Total roof system installation, including Sheet Metal Flashing and Trim Work, shall be in conformance with FM 4450, FM 4470, UL 580 or UL 1890.

G. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

H. Installer Qualifications: Engage an experienced Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

I. Refer to Roofing Sections for requirements relating to single source responsibility for all roofing and sheet metal work, including guarantees and temporary protection. Sheet Metal Flashing and Trim work shall be in accordance with roofing system manufacturer’s requirements so as not to void or compromise the roofing warranty.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.7 PROJECT CONDITIONS

A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of the work and protection of materials and finishes. Coordinate work with other Sections for material and finishes.

1.8 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

B. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209 or ASTM B221, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.

1. Surface: Smooth, flat.
2. Color: Coil Coated: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

a. Color: As selected by Architect from full range of industry colors and color densities.
b. Color Range: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

3. Exposed Coil-Coated Finishes:

a. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

4. Color: Match Architect's samples or as otherwise selected by Architect from manufacturer's full range for each project.
5. Concealed Finish: Pre-treat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

C. Stainless-Steel Sheet: ASTM A 666, Type 304, soft annealed, with No. 2B finish, unless harder temper is required for forming or performance; at least 0.0187 inch thick, unless otherwise indicated.

2.2 UNDERLAYMENT MATERIALS

A. Polyethylene Sheet: 6-mil thick polyethylene sheet complying with ASTM D 4397.

B. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, non-perforated.

C. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metals.
b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

C. Solder:

1. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 FABRICATED SHEET METAL FLASHING

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim in the shop to the greatest extent possible, and comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim without detectable oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant.

D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

H. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.

1. Fabricate from the following materials:

   a. Aluminum: 0.063 inch thick.

2. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.

B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.

1. Hanger Style: “U” shaped bracket anchored to masonry wall with downspout held in place with wire across the face.
2. Fabricate from the following materials:

   a. Aluminum: 0.024 inch thick.

2.7 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:

1. Aluminum: 0.032 inch thick.

B. Valley Flashing: Fabricate from the following materials:

1. Copper: 16 oz./sq. ft. thick.

C. Drip Edges: Fabricate from the following materials:
1. Aluminum: 0.032 inch > thick.

D. Eave, Rake and Ridge Flashing: Fabricate from the following materials:
1. Aluminum: 0.032 inch thick.

E. Counterflashing: Fabricate from the following materials:
1. Aluminum: 0.032 inch thick.
2. Stainless Steel: 0.019 inch thick.

F. Flashing Receivers: Fabricate from the following materials:
1. Aluminum: 0.032 inch thick.
2. Stainless Steel: 0.016 inch thick.

G. Roof-Penetration Flashing: Fabricate from the following materials:
1. Stainless Steel: 0.019 inch thick.

2.8 WALL SHEET METAL FABRICATIONS

A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch high, end dams. Fabricate from the following materials:

1. Aluminum: 0.032 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. Perform any corrective preparation work required to correct conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Promptly remove protective film, if any, from exposed surfaces of finished metals. Strip with care to avoid damage to finish.

3.3 INSTALLATION REQUIREMENTS

A. General: Except as otherwise indicated, comply with manufacturer's written installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual." Coordinate with installation of roof deck and other substrates to receive work of this Section and with vapor retarders, roofing insulation, roofing membrane, flashing, and wall construction, as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight. Installer shall check as-built conditions for dimension, square, plumb, level, (slope as required by design documents) and verify the manufacturer’s pre-manufactured component details for accuracy to fit walls, parapets, curbs, and other similar roof assembly details prior to fabrication of fabricated and corner components. The installer shall comply with manufacturers approved written installation guidelines, and recommended guidelines of SMACNA and the NRCA when setting and installing sheet metal flashing and trim components. Anchor units of work securely to structural substrates to withstand lateral and thermal stresses and inward and outward loading pressures, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams that will be permanently watertight and weatherproof. All to be in compliance with manufacturer's recommendations and requirements.

B. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.

C. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

D. Expansion Provisions: Install running lengths to allow controlled expansion for movement of metal components in relation not only to one another but also to adjoining dissimilar materials, including flashing and roofing membrane materials, in a manner sufficient to prevent water leakage, deformation, or damage. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

E. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws and/or metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.

G. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

H. Seal joints as required for watertight construction. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

I. Underlayment: Where stainless steel or aluminum is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.

J. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

K. Nail flanges of expansion joint units to curb nailers, at maximum spacing of 6" o.c. Fabricate seams at joints between units with minimum 3" overlap, to form a continuous, waterproof system.

3.4 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA and NRCA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets, straps, and twisted straps spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Fasten gutter spacers to front and back of gutter.
2. Loosely lock straps to front gutter bead and anchor to roof deck.
3. Anchor and loosely lock back edge of gutter to continuous cleat, eave or apron flashing.
4. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
5. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c. in between.

D. Splash Blocks: Install concrete splash blocks where downspouts discharge on low-slope roofs or onto adjacent sidewalks or grade.

3.5 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements**,** sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.

C. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at 16-inch centers.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of anchor and washer at 36-inch centers.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

3.6 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA and NRCA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.7 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.8 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.9 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturers written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes joint sealants for the following applications:

1. Exterior joints in the following vertical surfaces and horizontal non-traffic surfaces:

    a. Control and expansion joints.
    b. Joints in stone masonry.
    c. Perimeter joints of frames of doors, windows and louvers.
    d. Other joints as indicated.

2. Exterior joints in the following horizontal traffic surfaces:

    a. Control, expansion, Isolation and contraction joints in cast-in-place concrete slabs.
    b. Other joints as indicated.

3. Interior joints in the following vertical surfaces and horizontal non-traffic surfaces:

    a. Control and expansion joints on exposed interior surfaces of exterior walls.
    b. Perimeter joints of exterior openings.
    c. Vertical joints on exposed surfaces of interior unit masonry, concrete, walls and partitions.
    d. Perimeter joints between interior wall surfaces of frames of interior doors, windows and elevator entrances.
    e. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    f. Other joints as indicated.

4. Interior joints in the following horizontal traffic surfaces:

    a. Isolation joints in cast-in-place concrete slabs.
    b. Control and expansion joints in flooring.
    c. Other joints as indicated.

B. Exterior control and expansion joints in concrete pavements and curbs.

C. Exterior and interior control and expansion joints in masonry.

D. Exterior building, wall and sitework joints, including (but not limited to) concrete to concrete, concrete to masonry, masonry to masonry, masonry to metal, masonry to plaster, plaster to plaster, under saddles and thresholds and miscellaneous openings. Include running and bed joints in all sills. Metal shall be understood to include (but not limited to) door, window, louver and other metal frames.

E. Interior building, wall and partition joints, including (but not limited to) concrete to concrete, concrete to masonry, masonry to masonry, masonry to metal, masonry to steel, plaster to plaster, masonry to plaster and plaster to metal, masonry to drywall, plaster to drywall, metal to drywall, drywall to drywall. Include running and bed joints in all sills. Metal shall be understood to include (but not limited to) door, window, louver, lockers, access panels, fire extinguisher cabinets, and other metal frames.

F. All interior joints where plaster, drywall and the like terminates at dissimilar materials or assemblies where an open joint exists.

G. Control joints in flooring.

H. Perimeter of frames (door, window and louver frames, access panels, fire extinguisher cabinets, etc.) which adjoin exposed interior masonry and tile surfaces and similar surfaces.

I. All joints between mop receptors, lavatories, toilets and other plumbing fixtures, vanities, casework and countertops, back and side splashes, etc. where open joints exist between fixture and adjacent surfaces.

J. Other interior and exterior joints as shown and/or required.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. For sealants and sealant primers used inside the weatherproofing system, including printed statement of VOC content.

C. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

D. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

E. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.
5. FM 200 Suppression System: When an FM 200 fire suppression system is specified in any room in the building, all openings and penetrations must be sealed to establish an “air tight room”.

1.1 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
2. Disintegration of joint substrates from natural causes exceeding design specifications.

3. Mechanical damage caused by individuals, tools, or other outside agents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles or approved equivalent.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Non-membrane Roof Sealants: 300 g/L.
3. Sealant Primers for Nonporous Substrates: 250 g/L.
4. Sealant Primers for Porous Substrates: 775 g/L.
5. Modified Bituminous Sealant Primers: 500 g/L.

C. Colors of Exposed Joint Sealants: For each locations and adjoining materials, color as selected by Architect from manufacturer's full range.

2.3 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Pecora Corporation; 890NST or 890
b. Sika Corporation, Construction Products Division; Sikasil WS 290

C. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Pecora Corporation; 864NST or 890FTS-TXTR or 895NST or 898NST
    b. Sika Corporation, Construction Products Division; Sikasil WS 295
    c. Tremco Incorporated; Spectrem 3
    d. Dow Corning Corporation; DowSIL 756

2.4 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Single-Component, Mildew-Resistant, Neutral-Curing, Silicone Sealant for use at plumbing fixtures:

1. Available Products or approved equivalent:

    a. Pecora Corporation; 898 VOC 12 g/L.
    b. Sonneborn, Div of BASF; Omniplus, VOC 0 g/L.
    c. Tremco; Spectrem, VOC 8 g/L.

2. ASTM C920, Type and Grade: S (single component) and NS (non-sag).
3. Class: 25/50.
4. Use Related to Exposure: NT (non-traffic).

F. Multi-Component, Non-sag, Polyurethane Sealant for exterior joints:

1. Available Products:

    a. Pecora Corporation; Dynatrol II, VOC 14 g/L.
    b. Sonneborn, Div of BASF; 150, VOC 28 g/L.
    c. Tremco; Dymeric 240/240 FC, VOC 35/5 g/L.

2. ASTM C920, Type and Grade: M (multicomponent) and NS (non-sag).

3. Class: 50.
4. Use Related to Exposure: NT (non-traffic), M, A, G and O.

G. Multi-Component, Self Leveling, Polyurethane Sealant: Use in Joints subject to traffic and for Radon abatement sealing of concrete slabs and concrete slab to block walls.

1. Available Products:

a. Pecora Corporation; Urexpan NR-200, VOC 0 g/L.
b. Sonneborn, Div of BASF; Sonolastic SL-2, VOC 0 g/L.
c. Tremco; THC 900/THC901, VOC 90/105 g/L.

2. ASTM C920, Type and Grade: M (multicomponent) and P (pourable).
3. Class: 25.
4. Use Related to Exposure: SL, Traffic Grade

H. Single-Component, Non-sag, Silicone Sealant for interior fire rated applications in accordance with appropriate UL Design Systems:

1. Available Products:

a. Pecora Corporation; 864, VOC 12 g/L.
b. Sonneborn, Div of BASF; Omniseal 50, VOC 35 g/L.
c. Tremco; Spectrem 4TS, VOC 18 g/L.

2. ASTM C920, Type and Grade: S (multicomponent) and NS (non-sag).
3. Class: 50.
4. Use Related to Exposure: NT (non-traffic), Fire Rated Systems.

2.5 LATEX JOINT SEALANTS

A. Single-Component, Non-Sag, Acrylic Latex Sealant for interior and acoustical joints: Comply with ASTM C 834, Type P, Grade NF.

1. Available Products:

a. Pecora Corporation; AC-20+, VOC 31 g/L.
b. Sonneborn, Div of BASF; Sonolac, VOC 41 g/L.
c. Tremco; Tremflex 834, VOC 11 g/L.

2. ASTM C 834, Type and Grade: Type P, Grade NF.
3. Class: 7.5/7.5
4. Use Related to Exposure: General Purpose interior and exterior with slight to moderate movement.

2.6 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type B (Cylindrical flexible sealant backer rod with bi-cellular material with non-absorbing outer skin), non-gassing, non-exuding, chemically inert, non-absorbing, for cold applied sealants and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests and complying with VOC limits indicated.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

   a. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
   b. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, nonstaining, S, NS, 100/50, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

   a. Perimeter joints between interior wall surfaces and frames of exterior doors and windows.
   b. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.

1. Joint Locations:

a. Perimeter joints between interior wall surfaces and frames of interior doors.
b. Other interior joints as indicated on Drawings.

2. Joint Sealant: Acrylic latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Concealed mastics.

1. Joint Locations:

a. Aluminum thresholds.
b. Sill plates.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Butyl-rubber based.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Sealant Location:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Other joints as indicated.

2. Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, Silicone.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

3.4 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
2. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

SECTION 081113 – HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

A. Provide all labor, materials, accessories, equipment and incidentals to complete steel door and frame work as shown and/or specified, including but not necessarily limited to the following:

1. Exterior Flush Steel Doors.
2. Exterior and Interior Steel Frames.
3. Vision Panels, Sidelites, Transoms and Borrowed Lites.
4. Preparation for Hardware.
5. Interface Coordination to Work of Other Trades.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance and temperature-rise ratings, and finishes for each type of steel door and frame specified.

B. Shop Drawings: In addition to requirements below, provide a schedule of standard steel doors and frames using same reference numbers for details and openings as those on Drawings:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details.
3. Frame details for each frame type, including dimensioned profiles.
4. Details and locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, accessories, joints, and connections.
7. Details of glazing frames and stops showing glazing.

C. Coordination Drawings: Drawings of each opening, including door and frame, drawn to scale and coordinating door hardware. Show elevations of each door design type, showing dimensions, locations of door hardware, and preparations for any power, signal, and electrified and/or pneumatic control systems as required.

D. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on the Contract Drawings. Coordinate with flush wood doors, finish hardware, glass and glazing work.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames in accordance with manufacturer's written requirements and palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

B. Store doors and frames under cover at Project site in accordance with manufacturer's written requirements. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber.

1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating standard steel frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate installation of anchorages for standard steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete and/or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers of products that may be acceptable for inclusion in the work include, but are not limited to, the following:

1. Curries Company
2. Pioneer Industries
3. Steelcraft
4. or other equivalent SDI manufacturer

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B, suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled, only for reinforcements and other internal components not exposed to view.

C. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS), Type B; hot dipped, with minimum G60 (Z180) zinc (galvanized) or A60 (ZF180) zinc-iron-alloy (galvannealed) coating designation.

D. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591, Commercial Steel (CS), Class B coating; mill phosphatized.

E. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153, Class B.

F. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153.

G. Grout: Comply with ASTM C 476, with a slump of 4 inches for standard steel door frames built into concrete or masonry, as measured according to ASTM C 143.

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50 respectively; passing ASTM E 136 for combustion characteristics.

I. Glazing: Comply with requirements in Division 08 Section on Glazing.

J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STEEL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces and vertical edges, unless otherwise indicated. Comply with ANSI A250.8.

1. Design: Flush panel or as otherwise indicated on Drawings.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral-board, or vertical steel-stiffener core that produces doors complying with ANSI A250.8.

    a. Thermal-Rated (Insulated) Doors: At all exterior door locations and any other locations indicated, provide doors fabricated with thermal-resistance value (not less than R-2.44 or not greater than U factor of 0.41) in accordance with NFRC 100 and when tested according to ASTM C 1363.

3. Vertical Edges for Single-Acting Doors: Square edge.
4. Top and Bottom Edges: Closed with flush 0.042-inch thick end closures or channels of same material as face sheets. Provide exterior doors with top cap to protect against the weather.
5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), in 1-3/4-inch thickness and have 0.053-inch thick faces, Model 2 (Seamless).

C. Hardware Reinforcement: Fabricate reinforcement plates from same material as door face sheets to comply with the following minimum sizes:

1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.

D. Fabricate concealed stiffeners and hardware reinforcement from either cold-rolled or hot-rolled steel sheet.

2.4 STEEL FRAMES

A. General: Comply with ANSI A250.8 and with details indicated for type and profile.

B. Interior Frames: Fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior frame requirements.

1. Fabricate frames with mitered or coped and welded face corners and seamless face joints, unless otherwise indicated.
2. Frames for Level 2 Steel Doors: 0.053-inch thick steel sheet.
3. Frames for Wood Doors: 0.053-inch thick steel sheet.

4. Frames for Borrowed Lights: 0.053-inch thick steel sheet.

C. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with the following minimum sizes:

1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
2. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
3. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.

D. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.

E. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Post-installed Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

F. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

G. Fabricate concealed stiffeners and hardware reinforcement from either cold-rolled or hot-rolled steel sheet.

H. Plaster Guards: Formed from same material as frames, not less than 0.016-inch thick.

2.5 FABRICATION

A. General: Fabricate standard steel doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Steel Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints; fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.

3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners, unless otherwise indicated.
4. Plaster Guards: Weld guards to frame at back of hardware mortises in frames installed in concrete or masonry.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two anchors per jamb up to 60 inches in height.
        2) Three anchors per jamb from 60 to 90 inches in height.
        3) Four anchors per jamb from 90 to 120 inches in height.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof more than 120 inches in height.

7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

C. Hardware Preparation: Factory prepare standard steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."

1. Reinforce doors and frames to receive non-templated mortised and surface-mounted door hardware.
2. Comply with applicable requirements in ANSI A250.6 and ANSI/DHI A115 Series specifications for door and frame preparation for hardware. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

2.6 STEEL FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish standard steel door and frames after assembly.

B. Metallic-Coated Steel Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

C. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

D. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

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 steel doors and frames.

1. Examine roughing-in for embedded and built-in anchors to verify actual locations of standard steel frame connections before frame installation.
2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory.

B. Prior to installation and with installation spreaders in place, adjust and securely brace steel door frames for square, alignment, twist, and plumb.

C. Drill and tap frames to receive non-template mortised and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Provide frames of sizes, thickness, and designs indicated. Install standard steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Steel Frames: Install standard steel frames for doors, sidelights, transoms, borrowed lights, and other openings, of size and profile indicated. Comply with SDI 105.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-protection-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable glazing stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Apply bituminous coating to backs of frames that are filled with mortar, grout, and plaster to protect against antifreeze agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar as specified in Division 04 Section "Unit Masonry Assemblies."
4. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
6. Installation Tolerances: Adjust standard steel door frames for square, alignment, twist, and plumb to the following tolerances:

    a. Square: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumb: Plus or minus 1/16 inch, measured at jambs at floor.

C. Door Openings: Fit doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with standard steel door and frame manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c., and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including standard steel frames that are warped, bowed, or otherwise unacceptable.

B. Clean grout and other bonding material off doors and frames immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

D. Galvannealed Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 083113 - ACCESS DOORS AND FRAMES

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Access doors and frames for walls and ceilings. Provide at all locations where controls, junction boxes, valves, dampers or similar control devices are located inside of chase walls or in hard ceilings, as required by code to be accessible.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Detail fabrication and installation of access doors and frames for each type of substrate.

C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.

D. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer’s original unopened packaging, clearly and legibly identifying product and components.

B. Thoroughly inspect products upon delivery for damage. Minor damages may be repaired provided finish items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

C. Store materials in accordance with manufacturer’s written instructions and in a dry, protected, well ventilated place, under cover, out of direct sunlight. Unless otherwise required by the manufacturer, place units in a horizontal position with top up, spaced by blocking on wood sills at least 4" high, or by other means approved by the manufacturer that will prevent rust and

damage. Avoid use of non-vented plastic or canvas shelters that could create humidity chamber. Provide 1/4" spaces between each stacked unit to promote air circulation.

D. Remove any protective wrapping immediately after installation.

1.5 PROJECT CONDITIONS

A. Coordinate with other trades for installing frame and verify that other trades with related work are complete prior to installing floor access doors.

B. Mounting surfaces shall be straight, plumb, secure and of proper dimensions.

1.6 QUALITY ASSURANCE

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for vertical access doors and frames.

B. Provide all access door and frame components and assemblies manufactured by the same company to ensure compatibility of color, appearance and physical properties.

1.7 COORDINATION

A. If retaining this Article, also retain "Schedule" Paragraph in "Submittals" Article.

B. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 STEEL MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Steel Sheet: Electrolytic zinc-coated, ASTM A 591/A 591M with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS) with G60 (Z180) mill-phosphatized zinc coating.

D. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Baked-Enamel Finish: Minimum dry film thickness of 2 mils (0.05 mm).

E. Drywall Beads: 0.0299-inch (0.76-mm) zinc-coated steel sheet to receive joint compound.

F. Plaster Beads: 0.0299-inch (0.76-mm) zinc-coated steel sheet with flange of expanded metal lath.

G. Manufacturer's standard finish.

2.3 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

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 approved equal:

1. Acudor Products, Inc.
2. Babcock-Davis; A Cierra Products Co.
3. Bar-Co, Inc. Div.; Alfab, Inc.
4. Nystrom, Inc.

C. Flush Access Doors with Exposed Flanges:

1. Basis-of-Design Product: Acudor UF-5000.
2. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
3. Locations: Wall and ceiling.
4. Door Size: Min. 12”x12” or as indicated on drawings.
5. Metallic-Coated Steel Sheet for Door: Nominal, 16 gage.

a. Finish: Factory prime.

6. Frame Material: Same material, thickness, and finish as door.
7. Hinges: Manufacturer's standard.
8. Hardware: Lock.

D. Fire-Rated, Flush Access Doors with Exposed Flanges:

1. Basis-of-Design Product: Acudor FW-5050.
2. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer and interior latch release. Provide manufacturer's standard-width exposed flange, proportional to door size.
3. Locations: Wall and ceiling.
4. Door Size: Min. 12”x12” or as indicated on drawings.
5. Fire-Resistance Rating: Not less than that of adjacent construction.
6. Temperature-Rise Rating: 250 deg F at the end of 30 minutes.
7. Metallic-Coated Steel Sheet for Door: Nominal, 20 gage.

    a. Finish: Factory prime.

8. Frame Material: Same material and finish as door, nominal 16 gage.
9. Hinges: Manufacturer's standard.
10. Hardware: Prep for rim or mortised cylinder.

2.4 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view, provide materials with smooth, flat surfaces without blemishes.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder lock, furnish two keys per lock and key all locks alike.

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel and Metallic-Coated-Steel Finishes:

1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
2. Factory Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry-film thickness of 1 mil for topcoat.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 085200 - WOOD WINDOWS

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 fixed and operable wood-framed windows of the following type:

1. Vinyl clad.

1.3 DEFINITIONS

A. Performance class designations according to AAMA/WDMA/CSA 101/I.S.2/A440-05:

1. AW: Architectural.
2. HC: Heavy Commercial.
3. C: Commercial.
4. LC: Light Commercial.
5. R: Residential.

B. Performance grade number according to AAMA/WDMA/CSA 101/I.S.2/A440-05:

1. Design pressure number in pounds force per square foot (pascals) used to determine the structural test pressure and water test pressure.

C. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.

D. Minimum Test Size: Smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide wood windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of test size indicated below:

1. Size required by AAMA/WDMA/CSA 101/I.S.2/A440-05 for gateway performance.

2. Size indicated on Drawings.

B. Structural Performance: Provide wood windows capable of withstanding the effects of the following loads based on testing units representative of those indicated for Project that pass AAMA/WDMA/CSA 101/I.S.2/A440-05, Uniform Load Structural Test:

1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) at 33 feet (10 m) above grade, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.

   a. Basic Wind Speed: 110 mph (49 m/s)

2. Deflection: Design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch (19 mm), whichever is less, at design pressure based on testing performed according to AAMA/WDMA/CSA 101/I.S.2/A440-05, Uniform Load Deflection Test or structural computations.

A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of wood window indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:

1. Mullion details, including reinforcement and stiffeners.
2. Joinery details.
3. Expansion provisions.
4. Flashing and drainage details.
5. Weather-stripping details.
6. Glazing details.
7. Window cleaning provisions.
8. For installed products indicated to comply with design loads, include structural analysis data prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of wood windows and used to determine the following:

   a. Structural test pressures and design pressures from basic wind speeds indicated.
   b. Deflection limitations of glass framing systems.

C. Samples for Initial Selection: For units with factory-applied color finishes.

1. Include similar Samples of hardware and accessories involving color selection.

D. Samples for Verification: For wood windows and components required, prepared on Samples of size indicated below.

1. Operable Window: Full-size unit with factory-applied finish.
2. Hardware: Full-size units with factory-applied finish.
3. Weather Stripping: 12-inch- (300-mm-) long sections.

E. Product Schedule: For wood windows. Use same designations indicated on Drawings.

F. Qualification Data: For Installer, manufacturer and testing agency.

G. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency for each type, class, grade, and size of wood window. Test results based on use of downsized test units will not be accepted.

H. Maintenance Data: For operable window sash, operating hardware, weather stripping and finishes to include in maintenance manuals.

I. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to wood window manufacturer for installation of units required for this Project.

1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of data for wood windows, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer Qualifications: A manufacturer capable of fabricating wood windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

C. Source Limitations: Obtain wood windows through one source from a single manufacturer.

D. Product Options: Information on Drawings and in Specifications establishes requirements for wood windows' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

E. Product Options: Drawings indicate size, profiles, and dimensional requirements of wood windows and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements." Do not modify size and dimensional requirements.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

F. Fenestration Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440-05, “Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors," for

definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Provide AAMA/WDMA-certified wood windows with an attached label.

G. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify wood window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating wood windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace wood windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
c. Faulty operation of movable sash and hardware.
d. Deterioration of wood, metals, vinyl, other materials, and finishes beyond normal weathering.
e. Failure of insulating glass.

2. Warranty Period:

a. Window: Three years from date of Substantial Completion.
b. Glazing: 10 years from date of Substantial Completion.
c. Metal Finish: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Vinyl-Clad Wood Windows:

    a. Pella Windows, Pella Reserve – Traditional Wood, Single-Hung Window
    b. Crestline; a brand of Peachtree Companies, Inc. (The); TPC Acquisition, Inc.
    c. Weather Shield Mfg., Inc.
    d. Or approved equal

2.2 MATERIALS

A. Wood: Clear ponderosa pine, douglas fir, white oak, cherry, mahogany, vertical grain douglas fir, or another suitable fine-grained lumber; kiln dried to a moisture content of 6 to 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch (0.8 mm) deep by 2 inches (51 mm) wide; water-repellent preservative treated.

B. Vinyl for Cladding: Consisting of a rigid PVC sheath, made from PVC complying with ASTM D 4726, not less than 35-mil (0.9-mm) average thickness, in permanent, integral color, selected by Architect from manufacturer's full range of finish colors, mechanically bonded to exterior wood sash and frame members.

C. Wood Trim and Glazing Stops: Material and finish to match frame members.

D. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with wood window members, cladding, trim, hardware, anchors, and other components.

    1. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.

E. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

F. Reinforcing Members: Aluminum, or nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

G. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action and for complete concealment when wood window is closed.

    1. Weather-Stripping Material: Elastomeric cellular preformed gaskets complying with ASTM C 509.
    2. Weather-Stripping Material: Dense elastomeric gaskets complying with ASTM C 864.
    3. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/WDMA/CSA 101/I.S.2/A440-05.

H. Sliding-Type Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702.

1. Weather Seals: Provide weather stripping with integral barrier fin or fins of semirigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 701/702.

I. Replaceable Weather Seals: Comply with AAMA 701/702.

J. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

K. Sealant for perimeter openings: Unless otherwise indicated for sealants required for perimeter of window units, provide elastomeric type as recommended by window manufacturer and sealant manufacturer for joint size and movement, to remain permanently elastic, non-shrinking and non-migrating, paintable, mildew resistant, rust inhibitive, service temperature from -15 deg, F to 180 deg. F., VOC < 15. Provide products complying with AAMA 80-92 and be single-component, non-sag-sealant meeting FS-TT-S-00230C, Type II, Class A, in accordance with ASTM C 920, Type S, Grade NS, Class 25, Use-NT, A, M, G, and O, equal to DOW Window and Door 1000 Sealant or approved equal.

L. Joint Primer/Sealer: Provide type of joint primer/sealer recommended by sealant manufacturer for joint surfaces to be primed or sealed.

M. Bond Breaker Tape: Provide polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.

N. Sealant Backer Rod: Provide compressible rod stock of polyethylene foam, polyurethane foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable non-absorptive material as recommended by sealant manufacturer for back-up of and compatibility with sealant.

2.3 WINDOW

A. Window Type: As indicated on Drawings.

B. AAMA/WDMA Performance Requirements: Provide wood windows of performance indicated that comply with AAMA/WDMA/CSA 101/I.S.2/A440-05.

1. Performance Class and Grade: LC 25 minimum.

C. Condensation-Resistance Factor (CRF): Provide wood windows tested for thermal performance according to AAMA 1503, showing a CRF of 52.

D. Thermal Transmittance: Provide wood windows with a whole-window, U-factor maximum indicated at 1n5-mph (24-km/h) exterior wind velocity and winter condition temperatures when tested accordig to NFRC 100. .

1. U-Factor: 0.35 Btu/sq. ft. x h x deg F (2.0 W/sq. m x K) or less.

E. Solar Heat-Gain Coefficient (SHGC): Provide wood windows with a whole-window SHGC maximum of 0.55 or less (verify with glass selected), determined according to NFRC 200 procedures.

F. Sound Transmission Class (STC): (recommended for schools) Provide glazed windows rated for not less than 35 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.

G. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/WDMA 101/I.S.2/NAFS, Air Infiltration Test.

1. Maximum Rate: 0.3 cfm/sq. ft. (5 cu. m/h x sq. m) of area at an inward test pressure of 1.57 lbf/sq. ft. (75 Pa).

H. Water Resistance: No water leakage as defined in AAMA/WDMA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/WDMA/CSA 101/I.S.2/A440-05, Water Resistance Test.

1. Test Pressure: 15 percent of positive design pressure, minimum air pressure 3.75 lbf/sq. ft. (140 Pa).

I. Forced-Entry Resistance: Comply with Performance Grade 30 requirements when tested according to ASTM F 588.

J. Life-Cycle Testing: Test according to AAMA 910 and comply with AAMA/WDMA 101/I.S.2/NAFS.

K. Operating Force and Auxiliary (Durability) Tests: Comply with AAMA/WDMA/CSA 101/I.S.2/A440-05 for operating window types indicated.

2.4 INSULATED GLAZING

A. Construction: Factory glaze all windows with hermetically sealed insulating glass units with a dual seal of polyisobutylene and silicone. Separate glass by a desiccant filled aluminum spacer. Set glass into a continuous bed of silicone sealant and hold in place with removeable glazing stop beads to match frame material. Wrap around (marine) glazing which requires the removal and disassembling of the sash for re-glazing is not acceptable. Units shall be IGCC certified for a CBA rating level.

1. Exterior Glazing:

a. Thickness: 1/4 inch
b. Tint: Clear
c. Type: Tempered
d. Coating: Solar reflective

2. Interspace Content:

a. Argon filled

3. Low-e coating: PPG Solarban 60 coating on #2 or #3 surface.

4. Interior Glazing:

a. Thickness: 1/4 inch
b. Type: Tempered

2.5 HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with wood; designed to smoothly operate, tightly close, and securely lock wood windows, and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals.

B. Counterbalancing Mechanism: Comply with AAMA 902.

1. Sash-Balance Type: Concealed, spring-loaded, block-and-tackle type, of size and capacity to hold sash stationary at any open position.

C. Sill Cap/Track: Rigid PVC or other weather-resistant plastic track with manufacturer's standard integral color, of thickness, dimensions, and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior.

D. Locks and Latches: Designed to allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.

E. Roller Assemblies: Low-friction design.

F. Push-Bar Operators: Provide telescoping-type, push-bar operator or “T” style handle, designed to open and close ventilators with fixed screens.

G. Gear-Type Rotary Operators: Comply with AAMA 901 when tested according to ASTM E 405, Method A.

1. Operation Function: All ventilators move simultaneously and securely close at both jambs without using additional manually controlled locking devices.

H. Four- or Six-Bar Friction Hinges: Comply with AAMA 904.

1. Locking mechanism and handles for manual operation.
2. Friction Shoes: Provide friction shoes of nylon or other nonabrasive, nonstaining, noncorrosive, durable material.

2.6 INSECT SCREENS

A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Fabricate insect screens to fully integrate with window frame. Locate screens on inside of window and provide for each operable exterior sash or ventilator.

1. Aluminum Tubular Frame Screens: Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," Architectural C-24 or Monumental M-32 class per manufacturer’s standard.

B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, adjustable rollers, and removable PVC spline/anchor concealing edge of frame.

1. Aluminum Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet with minimum wall thickness as required for class indicated.
2. Finish: Anodized aluminum or Baked-on organic coating as selected and in color selected by Architect from manufacturer's full range.

C. Aluminum Wire Fabric: 18-by-16 (1.1-by-1.3-mm) mesh of 0.011-inch- (0.28-mm-) diameter, coated aluminum wire.

1. Wire-Fabric Finish: Black.Retain paragraph below for screened-window units with outward-opening sash or ventilators where wickets are necessary for sash or ventilator operation.

2.7 FABRICATION

A. Fabricate wood windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Fabricate wood windows that are reglazable without dismantling sash or ventilator framing.

C. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator, unless otherwise indicated.

1. Double-Hung Windows: Provide weather stripping only at horizontal rails of operable sash.

D. Factory machine windows for openings and for hardware that is not surface applied.

E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

2.8 WOOD FINISHES

A. Factory-Primed Windows: Provide manufacturer's standard factory-prime coat on exposed interior wood surfaces.

B. Factory-Finished Windows: Provide manufacturer's standard factory finish. Apply finish to exposed exterior and interior wood surfaces.

1. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.

1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.
3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Approved Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

E. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION 085200

SECTION 085652 - TRANSACTION WINDOWS

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. Sliding, transaction security windows.

B. Related Requirements:

1. Section 099123 "Interior Painting" for field painting interior security windows.

1.3 COORDINATION

A. Coordinate installation of anchorages for security windows. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in adjacent construction. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, weights and finishes for window units.

B. Shop Drawings: For security windows.

1. Include plans, elevations, sections, and attachment details.
2. Full-size section details of framing members, including internal armoring, reinforcement, and stiffeners.
3. Location of weep holes.
4. Hardware for sliding window units.
5. Glazing details.
6. Details of transaction counter

C. Samples for Initial Selection: For frame members with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of sizes indicated below:

1. Framing: 12-inch- (305-mm-) long sections of frame members.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports documenting inspections of installed products.

1. Field quality-control certification signed by Contractor.

C. Sample Warranty: For special warranty.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation of units required for this Project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Pack security windows in wood crates for shipment. Crate glazing separate from frames unless factory glazed.

B. Label security window packaging with drawing designation.

C. Store crated security windows on raised blocks to prevent moisture damage.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace security windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including deflections exceeding 1/4 inch (6 mm).
b. Failure of welds.
c. Excessive air leakage.
d. Faulty operation of sliding window hardware.

e. Faulty operation of transaction drawers.
f. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SLIDING, TRANSACTION SECURITY WINDOWS

A. Provide sliding, transaction security windows.

1. Ready Access (Basis of Design)
2. Kreiger Specialty Products
3. Quikserv Corp.

B. Basis of Design Product: Ready Access 275 Single Panel Pass-Thru Window.

C. Size: As indicated on drawings (custom size).

D. Configuration: One fixed-glazed panel and one horizontal-sliding glazed panel

E. Operation: Manual open/self-closing.

F. Framing: Fabricate perimeter framing, mullions, and glazing stops from aluminum as follows:

1. Profile: Manufacturer's standard, with minimum face dimension indicated.

a. Minimum Face Dimension: 2 inches (50 mm)

2. Depth: Manufacturer's standard

Retain subparagraph below if required.

G. Head and Jamb Framing: Designed for gasket glazing. Removable header access panel on secure side.

H. Door Type: Sliding, 1 door panel.

I. Opening Direction: Right to left. Customer View – Outside.

J. Frame: Extruded aluminum, ASTM B 221, Alloy 6063-T6 and 6063-T52.

K. Aluminum Sheet: ASTM B 209, Alloy 5005-AQ-H34.

L. Galvanized Steel Sheet: ASTM A 653, G90.

M. Bottom Sill: Angled downward, track-free.

N. Security: Automatically locks each time door closes. Security bar set.

O. Security Lock: Aluminum bar extrusion with sliding spring-loaded locking clip.

P. Fasteners: Stainless steel rivets and hex-head zinc-plated self-threading machine screws.

Q. Handle: Black Delrin handle with pressed-in stainless steel spring pins. Stainless steel handle mounting bracket. Stainless steel spring-loaded mounting base.

R. Glazing: 1/4-inch tempered glass, ASTM C 1048, clear.

S. Silicone Glazing Sealant.

T. Sliding Window Hardware: Provide roller track designed for overhead support of manufacturer's standard carrier supporting horizontal-sliding glazed panel with manufacturer's standard self-closing mechanism mounted in header. Provide [self-latching and self-locking pull and lock with two keys for each horizontal-sliding glazed panel.

U. Materials:

1. Mild Steel Plates, Shapes, and Bars: ASTM A36/A36M.
2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, CS (Commercial Steel), Type B; suitable for exposed applications.
3. Metallic-Coated Steel Sheet: ASTM A653/A653M, CS (Commercial Steel), Type B; with G60 (Z180) zinc (galvanized) or A60 (ZF180) zinc-iron-alloy (galvannealed) coating designation.
4. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, CS (Commercial Steel), Type B; free of scale, pitting, or surface defects; pickled and oiled.
5. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304
6. Aluminum Extrusions: ASTM B221 (ASTM B221M). Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength.
7. Aluminum Sheet and Plate: ASTM B209 (ASTM B209M).

2.2 FABRICATION

A. General: Fabricate security windows to provide a complete system for assembly of components and anchorage of window units.

1. Provide units that are reglazable from the secure side without dismantling the attack side of framing.
2. Prepare security windows for field glazing unless preglazing at the factory is indicated.

B. Framing: Miter or cope corners the full depth of framing; weld and dress smooth.

1. Fabricate framing with manufacturer's standard, internal opaque armoring in thicknesses required for security windows to comply with ballistics-resistance performance indicated.

C. Glazing Stops: Finish glazing stops to match security window framing.

1. Attack-Side (Exterior) Glazing Stops: Welded or integral to framing.
2. Secure-Side (Interior) Glazing Stops: Removable, coordinated with glazing indicated.

D. Welding: Weld components to comply with referenced AWS standard. To greatest extent possible, weld before finishing and in concealed locations to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

E. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

2.3 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.4 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: As selected by Architect from full range of industry colors and color densities.

2.5 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: No. 4.

2.6 ACCESSORIES

A. Glazing Strips and Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Molded EPDM or neoprene gaskets complying with ASTM D2000, Designations 2BC415 to 3BC620; molded PVC gaskets complying with ASTM D2287; or molded, expanded EPDM or neoprene gaskets complying with ASTM C509, Grade 4.
2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric backing.

B. Miscellaneous Glazing Materials: Provide material, size, and shape complying with requirements of glass manufacturers and with a proven record of compatibility with surfaces contacted in installation.

1. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
2. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.
3. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
4. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

C. Anchors, Clips, and Window Accessories: Stainless steel; hot-dip, zinc-coated steel or iron, complying with ASTM B633; provide sufficient strength to withstand design pressures indicated.

D. Sealants: For sealants required within fabricated security windows, provide type recommended by manufacturer for joint size and movement. Sealant shall remain permanently elastic, nonshrinking, and nonmigrating.

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 security windows.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of security window connections before security window installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of security windows.

D. Inspect built-in installations, before installing security windows, to verify that anchor installations comply with requirements. Prepare inspection reports.

1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
2. Perform additional inspections to determine compliance of replaced or additional work. Prepare anchor inspection reports.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing security windows to in-place construction. Include threaded fasteners for inserts, security fasteners, and other connectors.

B. Removable Glazing Stops and Trim: Fasten components with security fasteners.

C. Fasteners: Install security windows using fasteners recommended by manufacturer with head style appropriate for installation requirements, strength, and finish of adjacent materials. Provide stainless-steel fasteners in stainless-steel materials.

D. Sealants: Comply with requirements in Section 079200 "Joint Sealants" for installing sealants, fillers, and gaskets.

1. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction unless otherwise indicated.
2. Seal frame perimeter with sealant to provide weathertight construction unless otherwise indicated.

E. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.3 FIELD QUALITY CONTROL

A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.

B. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.

C. Prepare field quality-control certification that states installed products and their installation comply with requirements in the Contract Documents.

3.4 ADJUSTING

A. Adjust horizontal-sliding, transaction security windows to provide a tight fit at contact points for smooth operation and a secure enclosure.

B. Remove and replace defective work, including security windows that are warped, bowed, or otherwise unacceptable.

3.5 CLEANING AND PROTECTION

A. Clean surfaces promptly after installation of security windows. Take care to avoid damaging the finish. Remove excess glazing and sealant compounds, dirt, and other substances.

1. Lubricate sliding security window hardware.

B. Provide temporary protection to ensure that security windows are without damage at time of Substantial Completion.

END OF SECTION 085652

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 01 Specification Sections, apply to this Section.

B. This Section includes commercial door hardware for the following:
   1. Swinging doors.
   2. Other doors to the extent indicated.

C. Door hardware includes, but is not necessarily limited to, the following:
   1. Mechanical door hardware.
   2. Electromechanical door hardware.
   3. Automatic operators.
   4. Cylinders specified for doors in other sections.

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. ANSI/SDI A250.13 - Testing and Rating of Severe Windstorm Resistant Components for Swing Door Assemblies.
   3. ASTM E1886 - Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Shutters Impacted by Missiles and Exposed to Cyclic Pressure Differentials.
   4. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure difference.
   5. ASTM E1996 - Standard specification for performance of exterior windows, curtain walls, doors and storm shutters impacted by Windborne Debris in Hurricanes.
   6. ICC/IBC - International Building Code.
   7. NFPA 70 - National Electrical Code.
   8. NFPA 80 - Fire Doors and Windows.
   9. NFPA 101 - Life Safety Code.
   10. NFPA 105 - Installation of Smoke Door Assemblies.
   11. UL/ULC and CSA C22.2 – Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
   12. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:
   1. ANSI/BHMA Certified Product Standards - A156 Series
   2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.2 DESCRIPTION OF WORK

A. Definition: Door Hardware includes items known commercially as Door Hardware which are required for swing doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame.

B. Provide all Door Hardware necessary to complete the project, whether particularly mentioned or not, and match in quality and finish the material specified.

C. Door Hardware listed herein shall in no way be construed as a complete Hardware Schedule and shall be considered as an indication of the intended Hardware requirements desired by the Owner. It shall be the Hardware Supplier's responsibility to examine the Drawings and Door Schedule and provide all necessary or additional Hardware as required but not scheduled herein in order to properly complete each installation. Such items of hardware shall be of the same type, quality and quantity as that scheduled for similar doors used for similar purposes in other parts of the building. A Schedule of Fabrication and Delivery shall be executed to avoid any delay of the entire project.

1.3 HARDWARE SUPPLIER

A. Supplier: A recognized builders hardware supplier who has been furnishing hardware in the project's vicinity for a period of not less than 5 years, and who is or employs an experienced hardware consultant who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Owner, Architect, and Contractor.

1.4 CODES AND REGULATIONS

A. Door Hardware listed or furnished shall meet requirements of current Federal, State or Local Codes including IBC International Building Code 2018, New Jersey Edition. Items furnished and installed not meeting these requirements will be removed and replaced at no additional cost to the Owner.

B. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be equipped with fire exit hardware") provide UL label on exit devices indicting "Fire Exit Hardware".

1.5 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. Proof of Certification: Provide copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified installer of Windstorm assemblies.

E. 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.

F. 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.

G. 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 Submittals.

H. Final Hardware Schedule Content: Based on builders hardware indicated, organize hardware schedule into "Hardware Sets" with an index of doors and heading indicating complete designation of every item required for each door or opening. Include the following information.

1. Type, style, function, size, quality and finish of each hardware item.
2. Name, part number and manufacturer of each item.
3. Fastening components, sizes and other pertinent information.
4. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
5. Explanation of all abbreviations, symbols, codes, etc., contained in schedule.
6. Mounting locations and mounting templates for all hardware.
7. Door and frame sizes and materials with reinforcement requirements indicated for proper installation of hardware.
8. Submit manufacturer’s technical data and installation instructions for all electronic hardware.
9. Keying information.
10. Manufacturer's cuts on all hardware to be supplied.

I. Templates: Where required, furnish hardware templates to each fabricator of doors, and other work to be factory prepared for the installation of hardware.

J. Submittal Sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) critical in the project construction schedule. Include with schedule, the product data, samples, shop drawings of other work affected by builders hardware and other information essential to the coordinated review of hardware schedule.

K. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

L. Samples: Prior to submittal of the final hardware schedule and prior to final ordering of builders hardware, submit sample of each type of exposed hardware unit as requested, finished as required and tagged with full description for coordination with schedule.

M. Samples will be returned to the supplier. Units, which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.

1.6 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. 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.

C. 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.

D. Automatic Operator Supplier Qualifications: Power operator products and accessories are required to be supplied and installed through current members of the manufacturer's "Power Operator Preferred Installer" program. Suppliers are to be factory trained, certified, and a direct purchaser of the specified power operators and be responsible for the installation and maintenance of the units and accessories indicated for the Project.

E. Schedule Designations: Except as otherwise indicated, the use of one manufacturer's numeric designation system in schedules does not imply that another manufacturer's products will not be acceptable, Provided they comply with District Standards and unless they are not equal in design, size, weight, finish function, or other quality of significance.

F. 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.

G. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

H. 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.

I. Exit Doors: Openable at all times from the inside without the use of a key or any special knowledge or effort. Exceptions, enclosed courtyards shall be openable at all times from the exterior without the use of a key or any special knowledge or effort.

J. For all door hardware with wiring, provide adequate length of wiring to connect electrified hardware to junction and control boxes. Contractor to coordinate between subcontractors the wiring requirements and lengths in order to complete the Work.

K. Electronic Security Hardware:

1. Contractor shall schedule a meeting with their hardware consultant and their electrical subcontractor and all other subcontractors associated with the Work, and with the Owner, the Owner's Security Access Control Vendor, and the Architect, prior to the preparation of the shop drawings. Meeting shall be held to coordinate the Contractor's Work with the Owner's Work.
2. Coordinate installation of the electronic security with the Architect and Electrical Contractor for power and networking connections and provide installation and technical data to the Architect and other related sub-contractor(s).
3. Upon completion of the electronic security hardware installation, verify that all components are working properly and state in the required guarantee that this inspection has been performed. Refer to Section 087400 for additional information.

L. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.7 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".

1.8 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 Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to

source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. 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.

D. Responsibilities of Door Hardware Supplier:

1. Submittals: Coordinate and process submittals for Builders Hardware in same manner as submittals for other work.
2. Construction Schedule: Cooperate with Builders Hardware supplier in establishing scheduled dates for submittals and delivery of templates and builders hardware.
3. Coordination: Coordinate builder's hardware with other work. Furnish hardware supplier or manufacturer with shop drawings of other work where required or requested. Verify completeness and propriety of hardware with supplier.
4. Installation Information: The general types and approximate quantities of hardware required for this project are indicated at the end of this section in order to establish Contractors costs for installation.

1.9 OWNER'S INSTRUCTION:

A. Instruct Owner's personnel in operation and maintenance of hardware units.

1.10 MAINTENANCE:

A. Extra Service Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals Section.

1. Special Tools: Provide special wrenches and tools applicable to each different or special hardware component.
2. Maintenance Tools: Provide maintenance tools and accessories supplied by hardware component manufacturer.
3. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra service materials.

B. Maintenance Service: Submit for Owner's consideration maintenance service agreement for electronic products installed.

1.11 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Ten years for mortise locks and latches.
2. Seven years for heavy duty cylindrical (bored) locks and latches.
3. Two years for electromechanical door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

C. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

D. Products not furnished, under this Section include the following. Coordinating remain requirements of this Section.

1. Permanent core and keys to be furnished and installed by Contractor.
2. Best Keying System that are compatible with Schlage Electronic Locks.

E. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

F. Furnish all items of hardware required to complete the work in accordance with specifications and plans, whether indicated or not in the schedule, to provide the indicated and intended functionality for each door assembly.

G. Carefully inspect Project for the extent of the door hardware required to complete the Work. Where there is a conflict between these Specifications and existing hardware or existing conditions, notify the Architect in writing of the conflict with recommendations for resolving the problem for Architect's review and approval.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity, unless otherwise indicated:
   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 3'6": 4-1/2" standard or heavy weight as specified.
   b. Sizes from 3'7" to 4'0": 5" standard or heavy weight as specified.

3. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:
   a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

4. Acceptable Manufacturers:
   a. Bommer Industries (BO).
   b. Hager Companies (HA).
   c. McKinney Products (MK).

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Acceptable Manufacturers:
   a. Bommer Industries (BO).
   b. McKinney Products (MK).
   c. Pemko Manufacturing (PE).

C. Pin and Barrel Continuous Hinges: ANSI/BHMA A156.26 Grade 1-600 certified pin and barrel continuous hinges with minimum 14 gauge Type 304 stainless steel hinge leaves, concealed teflon coated stainless pin, and twin self lubricated nylon bearings at each knuckle separation. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Acceptable Manufacturers:
   a. Markar Products (MR).
   b. McKinney Products (MK).
   c. Pemko Manufacturing (PE).

D. Sliding and Folding Door Hardware: Hardware is to be of type and design as specified and should comply with ANSI/BHMA A156.14.

1. Sliding Bi-Passing Pocket Door Hardware: Provide complete sets consisting of track, hangers, stops, bumpers, floor channel, guides, and accessories indicated.
2. Acceptable Manufacturers:
   a. Hager Companies (HA).
   b. Johnson Hardware (JO).
   c. Pemko Manufacturing (PE).

2.3 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Acceptable Manufacturers:
   a. Securitron (SU) - EL-CEPT Series.
   b. Von Duprin (VD) - EPT-10 Series.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:
   a. McKinney Products (MK) - Electrical Connecting Kit: QC-R001.
   b. McKinney Products (MK) - Connector Hand Tool: QC-R003.

2. Acceptable Manufacturers:
   a. McKinney Products (MK) – QC-C Series.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

1. Manual flush bolts to be furnished with top rod of sufficient length to allow bolt 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. Acceptable Manufacturers:
   a. Burns Manufacturing (BU).
   b. Rockwood Manufacturing (RO).
   c. Trimco (TC).

B. Door Push Plates and Pulls: ANS/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
5. Acceptable Manufacturers:
   a. Burns Manufacturing (BU).
   b. Rockwood Manufacturing (RO).
   c. Trimco (TC).

2.5 CYLINDERS AND KEYING

A. Cylinders: Original manufacturer cylinders complying with the following:

1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.

B. Permanent Cores: Furnished and installed by Contractor; complying with the following:

1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.

C. Key Quantity: Provide the following minimum number of keys:

1. Construction Keys (where required): Ten (10).
2. Construction Control Keys (where required): Two (2).

D. Construction Keying: Provide temporary keyed construction cores.

E. Key Registration List (Bitting List):

1. Furnish a list of opening numbers with locking devices, showing cylinder types and quantities required when cylinders or cores are to be owner furnished.

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Acceptable Manufacturers:
   a. Corbin Russwin Hardware (RU) – ML2000 Series.
   b. No Substitution.

B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified.

1. Furnish with solid cast levers, standard 2 3/4” backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.
2. Locks are to be non-handed and fully field reversible.
3. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.2 requirements to 2 million cycles.
4. Acceptable Manufacturers:
   a. Corbin Russwin Hardware (RU) – CL3300 Series.
   b. No Substitution.

C. Hurricane and Tornado Resistance Compliance: Mechanical locking and latching devices to be U.L. listed for windstorm components where applicable. Provide the appropriate hurricane or tornado resistant products that have been independent third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.

2.7 ELECTROMECHANICAL LOCKING DEVICES

A. Electromechanical Mortise Locksets, Grade 1 (Heavy Duty): Subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below.

1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status

monitoring, deadbolt monitoring, and request-to-exit signaling. Support end-of-line resistors contained within the lock case. Unless otherwise indicated, provide electrified locksets standard as fail secure.

2. Acceptable Manufacturers:
   a. Corbin Russwin Hardware (RU) - ML20900 Series.
   b. No Substitution.

B. Hurricane and Tornado Resistance Compliance: Electromechanical locking devices to be U.L. listed for windstorm components where applicable. Provide the appropriate hurricane or tornado resistant products that have been independent third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.

2.8 STAND ALONE ACCESS CONTROL LOCKING DEVICES

A. Stand Alone Integrated Access Control Lockets and Exit Device Trim:

1. Acceptable Manufacturers:
   a. Schlage (SH) – CO-100 Series.
   b. No Substitution.

2.9 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.

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 A156.5.
4. Dustproof Strikes: BHMA A156.16.

2.10 CONVENTIONAL EXIT DEVICES

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

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
5. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in hardware sets. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.
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: Provide and install interior surface and concealed vertical rod exit devices 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. Rail Sizing: Provide exit device rails factory sized for proper door width application.
10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
11. Hurricane and Tornado Resistance Compliance: Conventional exit devices are to be U.L. listed for windstorm components where applicable. Provide the appropriate hurricane or tornado resistant products that have been independent third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

    1. Acceptable Manufacturers:
        a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
        b. Sargent Manufacturing (SA) - 80 Series.
        c. Von Duprin (VD) - 35A/98 XP Series.

C. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleable-iron top and bottom retainers and a primed paint finish.

    1. Provide keyed removable feature where specified in the Hardware Sets.
    2. Provide stabilizers and mounting brackets as required.
    3. Provide electrical quick connection wiring options as specified in the hardware sets.
    4. Acceptable Manufacturers:
        a. Corbin Russwin Hardware (RU) - 700/900 Series.

b. Sargent Manufacturing (SA) - 980S Series.
c. Von Duprin (VD) - 9954 Series.

2.11 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 including installation and adjusting information on inside of cover.
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. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
4. 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 physically handicapped, provide units complying with ANSI ICC/A117.1.
5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt and security type fasteners as required for proper installation.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 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. Acceptable Manufacturers:
   a. Corbin Russwin Hardware (RU) – DC6000 Series.
   b. LCN Closers (LC) - 4040 Series.
   c. Sargent Manufacturing (SA) - 351 Series.
   d. Norton Door Controls (NO) - 7500 Series.

2.12 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. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
   a. Stainless Steel: 300 grade, 050-inch thick.
4. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
5. Acceptable Manufacturers:
   a. Burns Manufacturing (BU).
   b. Rockwood Manufacturing (RO).
   c. Trimco (TC).

2.13 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Acceptable Manufacturers:
   a. Burns Manufacturing (BU).
   b. Rockwood Manufacturing (RO).
   c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified 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. Acceptable Manufacturers:
   a. Rixson Door Controls (RF).
   b. Rockwood Manufacturing (RO).
   c. Sargent Manufacturing (SA).

2.14 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 UBC 7-2, 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. Hurricane and Tornado Resistance Compliance: Architectural seals to be U.L. listed for windstorm components where applicable. Provide the appropriate hurricane or tornado resistant products that have been independent third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.

G. Acceptable Manufacturers:

1. National Guard Products (NG).
2. Pemko Manufacturing (PE).
3. Reese Enterprises, Inc. (RS).

2.15 ELECTRONIC ACCESSORIES

A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Acceptable Manufacturers:
   a. Sargent Manufacturing (SA) – 3280 Series.
   b. Securitron (SU) - DPS Series.

B. Power Supplies: Provide Nationally Recognized Testing Laboratory Listed 12VDC or 24VDC (field selectable) filtered and regulated power supplies. Include battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Acceptable Manufacturers:
   a. Corbin Russwin Hardware (RU) – 782.
   b. Sargent Manufacturing (SA) – 3500 Series.
   c. Von Duprin (VO) - PS.

2.16 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.

2.17 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Power Operator products and accessories are required to be installed through current members of the manufacturer's "Power Operator Preferred Installer" program.

D. 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.

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 ADJUSTING

A. Adjust hardware for smooth operation.

B. Whenever the hardware is installed more than a period of one month prior to the acceptance or occupancy of the space or area, the contractor shall return to the project one week prior to acceptance or occupancy and make a final check and adjustment of all hardware items in such space or area.

C. At the completion of the project, the manufacturer's suppliers or representatives shall inspect their hardware and make any corrections required as a result of errors or improper installation.

3.5 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.

3.6 SCHEDULE OF DOOR HARDWARE

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 at no additional cost to the Owner.

B. Door closers shall be furnished for all U.L. Labeled doors, Corridor doors and exterior doors even if not listed.

C. Comply with UL requirements for all fire rated openings. All fire rated doors shall be equipped with seals and door sweeps unless doors provided are equipped with intumescent seals and automatic door bottoms

D. All exterior openings shall be fully weather-stripped and provided with door closers including stop and hold-open features.

E. Manufacturer’s Abbreviations:
1. MK - McKinney
2. PE - Pemko
3. MR - Markar
4. RU - Corbin Russwin
5. RO - Rockwood
6. SH - Schlage Electronic Security (Owner Campus Standard Lockset)
7. RF - Rixson
8. NO - Norton
9. SU - Securitron

Finish List

Code	Description
AL	Aluminum
626	Satin Chromium Plated
630	Satin Stainless Steel
689	Aluminum Painted
GREY	Grey
BLACK	Black
US32D	Stainless Steel, Dull

Hardware Sets

Set: 1.0

Doors: 100, 107

3	Hinge, Hvy Wt	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK
1	Access Control Lock	CO-100-CY-50-KP RHO BD	626	SH
1	Cylinder Core	BY CONTRACTOR		00
1	Electric Strike	1500C	630	HS
1	SMART Pac Bridge Rectifier	2005M3		HS
1	Door Closer	CPS7500	689	NO
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Threshold	279x224AFGT MSES25SS		PE
1	Rain Guard	346C		PE
1	Gasketing (head/jamb)	S773BL		PE
1	Sweep	3452CNB		PE
1	Position Switch	DPS-M-BK		SU

Notes: Card reader, electric strike power and REX switch by security integrator (Contractor).
Electronic Operation: Valid code unlocks outside lever or valid card releases electric strike or key retracts latchbolt. Free egress at all times. In case of power loss, door remains locked and latched.

Set: 2.0

Doors: 109

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	CL3357 NZD CT7SD	626	RU
1	Cylinder Core	BY CONTRACTOR		00
1	Door Stop	403 (or) 441CU	US26D	RO
3	Silencer	608 (or) 609		RO

Set: 3.0

Doors: 106

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	CL3357 NZD CT7SD	626	RU
1	Cylinder Core	BY CONTRACTOR		00
1	Surface Overhead Stop	10-X36	652	RF
3	Silencer	608 (or) 609		RO

Set: 4.0

Doors: 103, 104

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Access Control Lock	CO-100-CY-50-KP RHO BD	626	SH
1	Cylinder Core	BY CONTRACTOR		00
1	Door Stop	403 (or) 441CU	US26D	RO
3	Silencer	608 (or) 609		RO

Set: 5.0

Doors: 105

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Classroom Lock	CL3355 NZD CT7SD	626	RU
1	Cylinder Core	BY CONTRACTOR		00
1	Door Stop	403 (or) 441CU	US26D	RO
3	Silencer	608 (or) 609		RO

Set: 6.0

Doors: 108

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Privacy Lock	CL3320 NZD	626	RU
1	Door Closer	R7500 (or) PR7500	689	NO
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Door Stop	403 (or) 441CU	US26D	RO
1	Gasketing (head/jamb)	S88BL		PE
1	Coat Hook	RM801	US32D	RO

Set: 7.0

Doors: 101

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Access Control Lock	CO-100-CY-50-KP RHO BD	626	SH
1	Cylinder Core	BY CONTRACTOR		00
1	Electric Strike	1500C	630	HS
1	SMART Pac Bridge Rectifier	2005M3		HS
1	Door Closer	R7500 (or) PR7500	689	NO
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Door Stop	403 (or) 441CU	US26D	RO
3	Silencer	608 (or) 609		RO

Notes: Card reader, electric strike power and REX switch by security integrator (Contractor).
Electronic Operation: Valid code unlocks outside lever or valid card releases electric strike or key retracts latchbolt. Free egress at all times. In case of power loss, door remains locked and latched.

END OF SECTION 087100

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

A. Provide all labor, materials, accessories, equipment, incidentals to complete gypsum board assembly work, as indicated and required including, but not necessarily limited to, the following:

1. Interior Gypsum Wallboard.
2. Non-Load-Bearing Steel Framing and Furring.
3. Metal Grid Ceiling and Soffit Suspension System.
4. Accessories and trim.
5. Taping and Spackling.
6. Reinforcing and blocking to receive and support the work of other trades.
7. Building in items furnished by other trades and/or contracts.

B. Related Work Specified Elsewhere:

Rough Carpentry	Division 6
Thermal Insulation	Division 7
Acoustical Panel Ceilings	Division 9
Painting	Division 9

1.3 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of product indicated.

B. Shop Drawings showing layout, locations, fabrication, and installation of all control and expansion joints including plans, elevations, sections, details of components and attachments of other units of work including concealed blocking.

C. Submit ceiling grid and soffit suspension system layout drawings, to scale, showing spacing, dimensions of members, direction of main runners, edge conditions where abutting other surfaces, seismic bracing details, custom trim and ceiling opening locations including; location of diffusers, grilles, lighting fixtures, smoke detectors, sprinklers, and other items.

1.4 QUALITY ASSURANCE

A. Comply with the requirements of the following:

1.	ASTM C 474	"Standard Test Methods for Joint Treatment Materials for Gypsum Board Construction."
2.	ASTM C 475	"Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board."
3.	ASTM C 645	"Standard Specification for Nonstructural Steel Framing Members."
4.	ASTM C 754	"Standard Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products."
5.	ASTM C 840	"Standard Specification for Application and Finishing of Gypsum Board."
6.	ASTM C 919	"Standard Specification for Use of Sealants in Acoustical Applications."
7.	ASTM C 954	"Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 inches to 0.112 in. in thickness."
8.	ASTM C 1002	"Standard Specification for Specification for Steel Drill Screws for the Application of Gypsum Panel or Metal Plaster Bases."
9.	ASTM C 1047	"Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base."
10.	ASTM C 1177	"Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing".
11.	ASTM C 1396	"Standard Specification for Gypsum Wallboard."
12.	GA-216	"Recommend Specifications for the Application and Finishing of Gypsum Board."

B. Sound Rated Assemblies: Provide materials and construction identical to assemblies indicated and in accordance with ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency to achieve the STC Rating indicated, or if not indicated, a minimum STC Rating of 50.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original unopened containers, packages or bundles bearing brand name and identification of manufacturer or supplier.

B. Use or develop a written plan for the management of the jobsite for the delivery, storage, installation and protection of the products until completion of the project.

C. Store materials inside under cover and in manner to keep them dry, protected from direct exposure to rain, snow, condensation, direct sunlight, surface contamination, corrosion, damage, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

D. Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal corner beads and trim from being bent or damaged.

1.6 PROJECT CONDITIONS

A. Comply with ASTM C 840 requirements gypsum board manufacturer's written recommendations, whichever are more stringent, for environmental conditions before, during and after application of gypsum board construction work.

B. Environmental Limitations: Room temperatures shall be maintained at not less than 50 degrees F, during application of gypsum board for a minimum period of 48 hours prior to, during and following application of gypsum board, joint treatment materials and bonding of adhesives.

C. Further maintain not more than 80 degrees F for 7 days prior to application of gypsum base, continuously during application, and after application until plaster skim coat is dry.

D. Avoid exposure to excessive, repetitive or continuous moisture, before, during, and after installation. Eliminate sources of moisture immediately

E. Ventilation: Adequate ventilation shall be maintained in the work area of building spaces as required to remove water in excess of that required for drying of joint treatment material and plaster skim coat during installation and curing period. Avoid drafts during dry, hot weather to prevent too rapid drying.

F. Do not install interior gypsum panels until installation areas are enclosed and conditioned.

G. Do not install panels that are wet, moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

H. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following or approved equivalent.

1. Metal Support Materials:

Dale/Incor, Inc.
National Gypsum Co.
Dietrich Industries, Inc.

2. Drywall Soffit Suspension Systems:

Armstrong World Industries, Inc.

Chicago Metallic Corp.
USG Interiors, Inc.

3. Gypsum Board and Related Products:

Georgia-Pacific Corp.
Gold Bond Building Products Div., National Gypsum Co.
United States Gypsum Co.

4. Deflection Track and Clips:

The Steel Network, Inc.
or approved equivalent.

2.2 STEEL PARTITION & SOFFIT FRAMING

A. Metal Studs: ASTM C645; 0.0329 (20 gauge) min. thickness of base metal unless otherwise indicated. Hot dipped galvanized per ASTM A 653, G 40, G60 at showers, toilet rooms, and other interior locations subject to high humidity, steam and water).

1. Depth of Section: 3-5/8”, or as otherwise indicated.

2. Runners: Match studs; type recommended by stud manufacturer for floor and ceiling support of studs, and for vertical abutment of drywall work at other work.

B. Furring Members: ASTM C645; 0.0179 (25 gauge) hat-shaped. Face width, 1-1/4" with 7/8" depth. Designed for screw attachment. Hot dipped galvanized per ASTM A 653, G 40, (G60 at showers, toilet rooms, and other interior locations subject to high humidity, steam and water).

C. Fasteners for Metal Framing: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

2.3 INTERIOR GYPSUM WALLBOARD

A. Panel Size: Provide panels in maximum lengths and widths available that will minimize joints in each area and correspond with the support system indicated.

B. All Gypsum Wallboards: ASTM C-1396; tapered edges.

1. Smooth Regular Faced Gypsum Wallboard: 5/8” thick, unless otherwise indicated, with long ends tapered.

2. Interior Gypsum Ceiling Board: 1/2” thick, unless otherwise indicated, manufactured with a special gypsum core containing additives to offer greater support and sag resistance for water based spray texture paints and insulation than 5/8” standard regular-type panels.

3. High Abuse-Resistant Gypsum Wallboard: 5/8” thick, unless otherwise indicated.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047. Provide manufacturer's standard trim accessories of types indicated for drywall work, formed of electro-galvanized steel 28 gage (minimum) unless otherwise indicated with either knurled and perforated or expanded flanges for nailing or screwing and beaded for concealment of flanges in joint compound.

1. Provide corner beads at outside corners, LC-Beads (J-Bead) at exposed panel edges, L-Beads, U-Beads, special L-kerf-type edge trim beads and one-piece expansion (control) joint beads.

2.5 JOINT TREATMENT MATERIALS

A. Joint Treatment Materials: Comply with ASTM C 475 and recommendations of manufacturer.

B. Joint tape:

1. Use perforated paper type for interior wallboard and exterior gypsum ceiling board. Use 10-by-10 glass mesh for glass mat gypsum sheathing board and veneer plaster base panels with plaster bonder. For tile backing panels, Use 2” alkali-resistant fiberglass tape unless otherwise recommended by the panel manufacturer.

C. Joint compound: Comply with ASTM C 475 and recommendations of the manufacturer.

1. For interior gypsum wallboard use setting-type taping compound followed by coats of setting-type sandable topping compound or as otherwise recommended by manufacturer.

2. For tile backing panels use the type recommended by the manufacturer for the application required at this project.

D. Concealed Acoustical Sealant: Non-drying, non-hardening, non-skinning, non-staining, non-bleeding, gunnable synthetic rubber sealant recommended for sealing interior concealed applications per ASTM C 919.

2.6 AUXILIARY MATERIALS

A. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

B. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot grouting steel door frames, transoms, side lites and borrowed lites.

C. Fastening Adhesive for Wood: ASTM C 557.

D. Fastening Adhesive for Metal: Special adhesive recommended for laminating gypsum panels to steel framing.

E. Steel Drill Screws: ASTM C 1002

F. Framing screws: ASTM C 646 - Corrosion Resistant

G. Power actuated fasteners: Type recommended by manufacturer for securing runners and furring strips to masonry and concrete.

H. Steel drill screws: ASTM C 954 - Corrosion Resistant for fastening panels to steel members.

I. Screws for cementitious backer units: Type and size as recommended by the backer unit manufacturer.

J. Isolation Strip at Exterior Walls: Foam gasket, adhesive-backed, closed-cell, vinyl foam strips that allow fastener penetration without foam displacement, 1/8” thick in width to suit steel stud size.

K. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

L. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."

PART 3 - EXECUTION

3.1 INSPECTION

A. Installer must examine the areas and conditions under which gypsum board assembly work is to be installed and notify the General Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 METAL SUPPORT

A. Comply with specified standards.

B. Metal Studs: Space maximum 16" o/c, unless otherwise indicated.

C. Furring Channels: Space maximum 16" o/c, unless otherwise indicated, and at not more than 4" from floor and ceiling lines or abutting walls, Secure in place 24" o/c on alternate flanges.

D. Install Framing, Bracing and Connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, etc., whether shown or not, as required to provide a complete, rigid, stable and structurally sound installation.

E. Install supplementary framing and bracing at terminations in the work and for support of fixtures, equipment services, heavy trim, handrails, grab bars, accessories, furnishings, otherwise indicated, to comply with applicable published recommendations of gypsum board manufacturer and "Gypsum Construction Handbook" published by United States Gypsum Co.

F. Extend partition framing tight to overhead roof construction except as otherwise shown.

G. Install auxiliary framing at termination of drywall work, and at openings, as required for support of both the drywall construction and other work indicated for support thereon.

H. Do not bridge building expansion joints and control joints with support system, frame both sides of joints with furring and other supports as indicated.

I. Install grid suspension system materials in accordance with Ceiling and Interior Systems Construction Association's (CISCA) "Ceiling System's Handbook" and manufacturer's printed instructions. Also comply with governing regulations, referenced standards, industry standards applicable to the work and as shown on final approved shop drawings.

J. Install grid suspension systems to comply with ASTM C 636, with hangers supported from overhead construction. Locate hangers near each end and spaced on 4' centers along carrying channel or main runners. Level to a tolerance of 1/8" in 12'-0".

K. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

1. Hangers: No. 12 hanger wires spaced 4'-0" o/c in both directions, closer spacing if loads increase due to additional loading. Provide extra wires to hang lights, diffusers, etc. independent of grid.
2. Provide additional independent hanger wires for lighting fixtures or air diffusers etc. to prevent fixture dropout, minimum four hangers per unit.
3. Main Beam: Install at 4'-0" o/c with internal splice having expansion detail on both ends. Rout holes spaced 8" o/c to receive cross tees (spaced 16" o/c).
4. Cross Tees: Install at 16" o/c.
5. Vertical Steps, Soffits, Slopes, Curves: Use Drywall Angle Clips, Direct Load Ceiling Clips, Radius Clips, Drywall Attachment Clips, Transition Clips, Beam Adapter Clips, Retention Clips, Beam End Retaining Clips, Stiffening Braces, etc. or approved equivalent and additional wires as needed.
6. Accessories: Use Perimeter Trim and Angle Trim, Perimeter Channel Molding, Clips, Reinforcing Plates as recommended by system manufacturer or approved equivalent and additional wires as required.

L. Drywall to Acoustical transition: To form a transition from a drywall ceiling to an acoustical ceiling, use Drywall Transition Clips which allows use of the grid as a transitional trim.

M. Provide additional framing and blocking to build in and support items furnished in other Sections and other Contracts.

3.3 INSTALLATION OF METAL SYSTEM SUPPORT

A. Attach metal floor and top tracks in accordance with ASTM C 745 to beams and to underside of roof deck with suitable fasteners spaced no more than 24" on centers. Apply three (3) continuous bead of acoustical sealant above ceiling runner channels.

B. Install metal studs of appropriate gage and depth at specified spacing to meet intended fire rating and structural requirements.

C. Insert metal studs into floor and ceiling tracks and twist into position. Space studs on 16 inch centers. Screw studs to bottom and top/ceiling runners with sheet metal screws, (2) at top/ceiling and bottom. Provide additional studs not more that 2 inches from abutting partitions, and other construction. At corners, position on stud so that it forms the outside corner. Construct rough bucks and erect in place by cutting flanges and rigidly fastening to face of double studs with screws. Provide stud on each side of control joint set 1/2 inches apart.

D. Provide offsets and furring framing to form soffits, for pipe chases and other work. Fabricate special framing and hangers using 1-1/2" screw channels in addition to studs and runners specified. Space framing at not greater than 20" centers. Fasten members where required for rigidity using sheet metal screws or staples, as recommended by framing manufacturer.

E. Provide additional framing to build in and support items such as handrails, grab bars, electrical components, etc. furnished under other sections. All work shall be accurately located, plumb, level and true to line.

3.4 WALLBOARD INSTALLATION

A. Installation of gypsum board products shall be in accordance with ASTM C 840 “Standard Specification for Application and Finishing of Gypsum Board”.

B. Inspect all surfaces and framing to which gypsum wallboard is to be applied. Remedy all conditions that will jeopardize satisfactory finish walls prior to installation of drywall. Check alignment and plumb of all framing and furring. Insulation will be double layer of wallboard unless noted otherwise.

C. Install sound attenuation blankets as indicated, and in accordance with insulation manufacturer’s recommendations for installation and attachment, prior to gypsum base unless readily installed after base has been installed on one side.

D. Install appropriate gypsum panel perpendicular to the framing and up against the floor and metal deck. Use the correct type and length of fastener, including spacing to meet the intended fire resistance rating. Install panels on both sides of the metal framing unless otherwise indicated.

E. Install gypsum soffit and ceiling boards across framing to minimize the number of abutting end joints and avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

F. Install single layer wallboard assemblies horizontally with Type "S" Bugle head drywall screws spaced not more than 12" o.c. Stagger joints on both sides of two sided partitions. Tightly install sound or thermal batt insulation as indicated between studs. Run three continuous beads of caulking at top of beam prior to installing wallboard. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.

G. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions. Provide temporary bracing as required until fully adhered.

H. Install gypsum board with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16-inch open space between panels. Do not force into place.

I. Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories. Spacing of control and expansion joints shall be as shown and/or in accordance with the gypsum board manufacturer’s written recommendations.

J. Install in maximum practical lengths to span wall and ceiling framing without end (butt) joints. If butt joints do occur, stagger joints and locate as far as possible from center of walls and ceilings.

K. Cut openings in gypsum board to fit items to be built in, including electrical outlets, accessories, etc. Openings shall fit snugly and shall be small enough to be covered by plates and escutcheons. Both face and back paper shall be cut for all cutouts that are not made by use of a saw. Support gypsum board securely around all cutouts and openings.

L. Allow the other trades to install the needed services (MEP) through the first layer of gypsum board.

M. Install all required through stop penetrations. Continue installing the remaining gypsum panels to complete the wall in accordance with the fire rated design.

N. Install fasteners not more than 1" and no closer than 3/8" to end or edges. Space fasteners opposite each other on adjacent ends or edges. Begin fastening from center of wallboard and proceed toward outer end of edges. Apply pressure on wallboard adjacent to fasteners being driven to ensure that wallboard will be secured tightly to framing members. Check for looseness at fastener. Drive fasteners with shank reasonably perpendicular to face of board. Drive screws with a power screwdriver of type recommended by the wallboard manufacturer. Surface of head shall be below surface of paper without cutting paper. Apply acoustic sealant at all penetrations for electric receptacles, switches, wire, piping, ductwork and other applicable sources of sound transmission.

O. Pack voids in steel door and lite frames and the like, etc. with sound attenuation.

3.5 ACCESSORY INSTALLATION

A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges by nailing or stapling in accordance with manufacturer's instructions and recommendations.

B. Install metal corner beads at external corners of drywall work.

C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where semi-finishing type is indicated. Install L-type trim where work is tightly abutted to other work, and install special kerf-type where other work kerfed to receive long leg of L-type trim. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).

D. Install J-type semi-finishing trim where gypsum board edges are not covered by applied moldings.

E. Omit fastening wallboard closer than one support away from area where casing trim will be installed. Insert metal flange between wallboard and bearing surface, and move in until properly aligned. Fasten wallboard through metal flange before bedding perforated tape.

F. Maintain metal edge in a true line.

3.6 JOINT TREATMENT

A. Apply bedding compound to edge and end joints and to fastener heads. Use types as recommended by gypsum manufacturer for use with gypsum product being installed. Shear off surplus leaving a tapered groove for embedding tape. Leave no material on high edge. Allow 12 hours for drying before taping.

B. Apply a uniformly thin layer of bedding compound over the joint approximately 4" wide. Center tape over joints and embed into compound.

C. Allow compound to dry thoroughly for approximately 24 hours. Cover tape with a coat of compound and spread out 3" on each side of tape. Feather out at edges.

D. After preceding coat is thoroughly dry, apply another coat with slight uniform crown over joints. This coat must be smooth and with edges feathered out 3" beyond preceding coat.

E. All fastener heads and dimples shall receive at least three (3) coats of compound. Apply as each coat is applied to joints, allowing at least 24 hours between each coat.

F. Cover flanges of beads and trim with at lease two (2) coats of compound. First layer shall be bedding compound. Apply along with respective coats of compound on joints. Feather out compound approximately 9" from metal bead.

G. Sand coats of compounds when thoroughly dry and sanding is needed. Avoid roughing surface of gypsum board product.

H. Leave wallboard uniformly smooth and ready for decoration.

I. Provide final protection and maintain conditions, in a manner suitable to installer, which ensures gypsum board assembly work being without damage or deterioration at time of substantial completion.

END OF SECTION 092900

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:

1. Acoustical Panels.
2. Metal Suspension Systems.
3. Metal Edge Moldings and Trim.
4. Acoustical Sealant.
5. Trim, profiles, steps and coordination of ceiling installation with entrance door operator hardware.
6. Miscellaneous accessories including Beam End Retaining Clips, Hold-Down Clips, Stiffening Braces and Hanger Wire, etc.

B. Related Requirements:

1. Section 092116 "Gypsum Board Assemblies" for ceilings and soffits.
2. Division 22 – Plumbing related work.
3. Division 23 – Mechanical related work.
4. Division 26 – Electrical related work.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product and accessory.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6-inch square samples of each type, color, pattern, and texture.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch long Samples of each type, finish, and color.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components including spacing, direction of main runners, edge conditions, trim(s) and room centering.
2. Structural members to which suspension systems will be attached.
3. Size and location of initial access modules for acoustical panels.
4. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Access panels.
    d. Smoke Detectors.

5. Perimeter moldings.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to one (1%) percent of quantity installed, but not less than 300 square feet of each type.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Contractor should be aware that the reflected ceiling plans and layouts may vary due to job conditions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS, GENERAL

A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.

B. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

C. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.

D. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

E. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.3 ACOUSTICAL PANEL TYPES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers of products that may be include in the work include, but are not limited to the following, or approved equal:

1. Armstrong Corporation. (Basis of Design for performance, design and quality)
2. CertainTeed Corporation, a Saint-Gobain Company.
3. USG Corporation.

B. Acoustical panel designations below are interior applications. Provide antimicrobial paint to inhibit mold and mildew growth and provide 30 year performance guarantee against sag or warp.

C. ACP-1

Panel Style/Model:	#1775HRC, Dune Square Lay-in & Tegular
Size:	24”x24”x5/8”
Fire Rating:	Class A, not for use as a fire rated ceiling assembly
NRC:	0.50
CAC:	35
LR:	0.83
Color	White
Anti-mold & Mildew	BioBlock +
Sag Resistant	Humi-guard +
Certified Low VOC Emissions	Third party certified compliant: CalGreen Title 24; ANSI/ASHRAE/USGBC/IES Standard 189.
Warranty	30 Year Performance Guarantee & Warranty
Suspension System:	Superfine 9/16” Exposed Tee System, steel
Color	White

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

C. Components: Main runner and cross tees shall be double-web hot dipped galvanized steel construction per ASTM A635 with 15/16” type exposed flange design, unless otherwise indicated. Members shall be fire/flame rated. Each exposed bottom flange shall be continuous with unbroken roll formed cap the length of the member. Cap shall be steel, finished as specified below.

1. Structural Classification: Intermediate duty.
2. Main Beam: Routed 6” center to center, continuously along the length of its web to locate intersecting cross tees. Web Height shall be 1-1/2”.
3. 4’ Cross Tees: Web height shall be 1-1/2”.
4. 2’ Cross Tees: Web height shall be 1-3/8”.
5. End condition of Cross Tees: Staked-on (stab) end detail with override flange.
6. 2” beam end steel retaining clip: joins main beam or cross tee to wall moldings and web of suspension system with no visible pop rivets (Armstrong BERC2 or approved equal).
7. Main beam spacer clip, used to space two parallel main beams for air supply or return, 48 inches on center maximum (Armstrong MBSC2 or approved equal).
8. Adjustable grid spacer clip, used to space two parallel main beams for light fixtures, air diffusers, etc. (Armstrong GSC 9, 12, or 16, or approved equal).

D. Cross Tee shall be double web bulb section of steel conforming to ASTM A 366, web height 1-1/2" and have a 15/16" bottom flange. Exposed bottom flange shall be continuous with unbroken roll formed cap the length of the member.

E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 12 gauge diameter wire (Armstrong 7891 or approved equal).

F. Hanger Rods or Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

G. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch thick, galvanized-steel sheet complying with ASTM A 653, G90 coating designation; with bolted connections and 5/16-inch diameter bolts.

H. Hanger Channels shall be 1 1/2"; 0.475 lb. per 1,000 ft.; cold rolled steel or 1.12 lb. per 1,000 ft. hot rolled steel for integrating with metal stud framing for supporting suspended ceiling system.

I. Bulb Tee Hanger shall be used for suspending bulb tees from 1 1/2" hanger channels - hanger will slide onto and hang from channel and bulb tee will slide and be clipped to bulb tee hanger. Hanger is also known as "New York City Clip".

J. Stiffening Brace shall be provided to the entire grid system of vestibule areas leading to the exterior and within 10 feet of exterior doors in areas exposed to wind uplift of up to 90 lbs./sq. ft. Brace shall be attached between the upper and lower ties on each vertical hanger wire. Combine with hold-down clips.

K. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

L. Lighting fixtures to have lighting fixture connect to (but not be supported to) the ceiling grid (Armstrong LFC Fixture Clip or approved equal).

2.5 METAL SUSPENSION SYSTEM

A. Available Manufacturers: Subject to compliance with requirements, manufacturers of products that may be include in the work include, but are not limited to the following, or approved equal:

1. Armstrong (Basis of Design for performance, design and quality).
2. Certain Teed.
3. Chicago Metallic.
4. USG.

B. Refer to Part 2.3 for suspension systems listed with specific Acoustic Panel Ceiling types.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Available Manufacturers: Subject to compliance with requirements, manufacturers of products that may be include in the work include, but are not limited to the following, or approved equal:

1. Armstrong (Basis of Design for performance, design and quality).
2. Certain Teed.
3. Chicago Metallic.
4. USG.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with the following:

1. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C 635 and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

D. Special Profiled Perimeter Trim as indicated and shall be of extruded aluminum channel trim compatible with the exposed suspension system. Profile height as indicated and finished to match ceiling grid.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Unless otherwise indicated on the drawings, avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook." Comply with governing regulations, referenced standards, industry standards applicable to the work and as shown on final approved shop drawings.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. Attach hangers to structural members.
8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

10. All light fixtures, ductwork, diffusers, signage, fire alarm, audio / visual, etc. materials and equipment is not permitted to be hung from the same panel and grid suspension systems. Such material and equipment must be independently suspended from the structure above.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Suspend main runners not more than 48" center-to-center, from overhead structure by not less than #12 gauge galvanized steel wire spaced 48", center-to-center, accurately leveled. Join cross tees to main runners through pre-routed openings in runners, locking webs together by means of die-formed end tabs to form a positive interlock. Main runners and cross tees shall rest on angel moldings at walls.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
6. Install hold-down and/or impact clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.
7. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 COORDINATION

A. Cooperate with other trades for installation of their materials and equipment, particularly with those installing the ductwork ceiling diffusers, electrical fixtures and plumbing fixtures so that

diffusers, lighting fixtures and other items are located on center lines of tile or on centers of joints, as shown on approved shop drawings.

B. Where light fixtures or other recessed items occur in ceilings, frame properly to permit installation of such recessed items, and do all necessary cutting and fitting of acoustical materials and suspension systems to accommodate work. Cut neatly around all pipes passing through ceilings.

3.5 CLEANING AND PROTECTION

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

B. The Installer shall advise the Contractor of required protection for the acoustical ceilings, including temperature and humidity limitations and dust control, so that the work will be without damage and deterioration at the time of acceptance by the Owner.

END OF SECTION 095113

SECTION 096500 – RESILIENT TILE FLOORING AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

A. Provide all labor, materials, accessories, equipment and incidentals to complete Resilient Flooring work, as shown and/or specified, including but not necessarily limited to the following:

1. Vinyl Composition Tile Flooring.
2. Resilient Rubber Wall Base.
3. Resilient Flooring Accessories.
4. Inspection and preparation of subfloors.
5. Design patterns, logos, features and borders.

B. Related Sections Specified Elsewhere:

Miscellaneous Metals	Division 5
Rough Carpentry	Division 6

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing resilient floor coverings of the type(s) required for this Project and with a record of successful in-service performance and who is certified or approved by the flooring manufacturer.

B. Source Limitations: Obtain each type, color, and pattern of each type of resilient flooring product specified from one source for each resilient floor covering product with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

C. Fire Test Performance: Provide resilient flooring products and accessories that comply with the following fire performance characteristics as determined by testing products per ASTM test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Critical Radiant Flux: Class II, Not less than 0.22 watts per sq. cm when tested in conformance with ASTM E 648.

2. Smoke Density: Less than 450 in conformance with ASTM E 662.
3. Static Coefficient of Friction: Greater than 0.6 for level surfaces and greater than 0.8 for ramped surfaces in accordance with ASTM D 2047.

1.4 REFERENCES

A. ASTM

1. ASTM E 648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
2. ASTM E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
3. ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
4. ASTM F 1482, Standard Guide to Wood Underlayment Products Available for Use Under Resilient Flooring.
5. ASTM F 1861 Standard Specification for Resilient Wall Base.
6. ASTM F 1869 Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
7. ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
8. ASTM E1347 - 06(2011) Standard Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry.
9. ASTM D5116 - 10 Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products and California Department of Public Health (CDPH) Standard Method V1.1-2010.
10. ASTM D6866 - 12 Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis.

B. ISO

1. ISO 14001 Environmental management systems -- Requirements with guidance for use.
2. ISO 14021 Environmental labels and declarations-Self-declared environmental claims (Type II environmental labeling).
3. ISO 14024 Environmental labels and declarations -- Type I environmental labeling -- Principles and procedures.
4. ISO 14025 Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures.

C. NSF/ANSI 332: Sustainability Assessment for Resilient Floor Coverings.

D. NFPA

1. NFPA 253 Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
2. NFPA 258 Standard Test Method for Measuring the Smoke Generated by Solid Materials.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated, including manufacturer's installation instructions, for each type of product specified.

B. Shop Drawings: For each type of product. Include floor tile layouts, stair accessory, base, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.

C. Samples for Initial Selection: For each type of product indicated.

D. Product Schedule: For resilient products. Use same designations indicated on Drawings.

E. Qualification Data: For qualified Installer.

F. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 DELIVERY, STORAGE AND HANDLING

A. Store and handle materials in strict compliance with manufacturer's written instructions.

B. Deliver resilient flooring and accessory products and installation accessories to the Project site in manufacturer's original unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

C. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces, store rolls upright.

D. Move resilient products and installation accessories into spaces where they will be installed at least 72 hours in advance of installation.

1.7 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Maintain relative humidity in spaces to receive resilient flooring products and accessories before, during, and after installation within the range recommended in writing by manufacturer.

C. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

D. Close spaces to traffic during floor tile installation.

E. Close spaces to traffic for 48 hours after floor tile installation.

F. Install floor tile after other finishing operations, including painting, have been completed.

G. Moisture content of concrete slabs and environmental conditions must be within limits recommended by manufacturer of products being installed for sufficient bonding with adhesives as determined by moisture tests.

1.8 WARRANTY

A. Resilient Flooring: Submit a written warranty executed by the manufacturer, agreeing to repair or replace resilient flooring that fails within the warranty period.

B. Warranty Period: 5 years.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

D. For the Warranty to be valid, this product is required to be installed using the appropriate Armstrong Guaranteed Installation System. Product installed not using the specific instructions from the Guaranteed Installation System will void the warranty.

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. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
2. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Designs, Logos, Features, Colors and Patterns: Multiple colors for patterns, logos, features, borders, fields and designs shall be selected by Architect from manufacturer's full range of colors.

B. Vinyl Composition Tile: Armstrong, or approved equal, complete Commercial grade in full range of colors and complement series tiles at 1/8" x 12" x 12" including, feature strips at 1/8" x 1/2" x 12", keys at 1/8" x 1/2" x 12" or approved equal. Tiles shall have a minimum static coefficient of friction greater than 0.6 for level surfaces, greater than 0.8 for dry ramped surfaces and in conformance with ASTM F 1066 Standard Specification for Vinyl Composition Floor Tile, Composition 1, (non-asbestos), Class I (solid color tiles), Class II (through pattern tiles).

2.2 RESILIENT RUBBER WALL BASE (RB)

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following, or approved equal:

1. Johnsonite.
2. Roppe.
3. Armstrong.

B. Resilient Base Standard: ASTM F 1861.

1. FS SS-W-40a, Type I (rubber).
2. Style B Cove (base with toe).
3. Minimum Thickness: 0.125 inch (3.2 mm).
4. Height: 4 inches (102 mm).
5. Lengths: Coils in manufacturer's standard length.
6. Outside Corners: Preformed.
7. Inside Corners: Preformed.
8. Matching end stops.
9. Phthalate Free material.
10. ASTM E 648, Standard Test Method for Critical Radiant Flux of 0.45 watts/cm^2 or greater, Class I.
11. ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, Class A, Smoke <450.
12. Finish: As selected by Architect from manufacturer's full range.
13. Colors and Patterns: As indicated by manufacturer's designations, or if not indicated, as selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Concrete Slab Primer: Non-staining type approved by the flooring product manufacturer.

C. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

    a. Rubber Floor Adhesives: Not more than 60 g/L.
    b. Cove Base Adhesives: Not more than 50 g/L.

D. For sealing joints between the top of wall base or integral cove cap and irregular wall surfaces such as masonry, provide plastic filler applied according to the manufacturer's recommendations

E. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

F. Resilient Edge Strips: Homogenous vinyl or rubber composition; 1/8" thick; not less than 1" wide; tapered or bullnose edge as selected by the Architect.

G. Floor Polish: Provide protective liquid floor polish products as recommended by the product manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

    a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
    b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are same temperature as space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles in pattern indicated, or if not indicated, square with room axis and quarter turn.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, non-staining marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern

between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

3.5 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor coverings that would otherwise be exposed.

3.6 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

C. Floor Polish: Remove soil, visible adhesive and surface blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply two coat(s).

D. Cover resilient products until Substantial Completion.

END OF SECTION 096500

SECTION 099000 – PAINTING

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 DESCRIPTION OF WORK

A. Provide all plant, labor, materials, accessories, equipment and incidentals required to complete Painting and Coating work, including but not necessarily limited to, the following:

1. Surface preparation, priming and finish painting and coating of surfaces, except as otherwise specified.
2. Multiple colors, patterns, borders, fields and designs as indicated and/or selected by the Architect.
3. Finish painting and coating primed surfaces, except as otherwise indicated.
4. Exposed to view structural steel, joists, decking, lintels, covered and bare pipes and ducts (including color coding), hangers and the like along with primed metal surfaces of mechanical and electrical equipment, unless otherwise indicated, are to be painted and are included in the work of this section.
5. Do not paint prefinished items, conceal surfaces, finished metal surfaces, operating parts and labels.
6. Where touch-up painting and coating work is required, re-finish the entire surface plane.
7. All other surfaces, not specifically noted, that require painting or coatings.

B. Paint or coat exposed surfaces, except where the finish schedule indicates that a surface or material is not to be painted, coated or is to remain natural. If the schedules do not specifically mention an item or a surface, paint or coat the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.

1. Painting and coating work includes field finishing of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

C. Following categories of work are not included as part of field applied finish work or are included in other sections of these specifications.

1. Shop Priming: Shop priming of ferrous metals items is included under various sections covering structural steel, miscellaneous metal, hollow metal work and similar items.

2. Factory finished materials and equipment, including aluminum doors and frames, aluminum windows, skylights, curtain walls, exterior wall louvers, toilet partitions, toilet accessories, architectural woodwork to extent shop finished, prefinished wood doors, storage shelving, lockers, visual display board trim, prefinished gravel stop, coping and fascia, metal edges, flashing, cyclone fence, acoustic plaster, and similar items.
3. Painting, coating and identification systems for mechanical and electrical work is specified in Plumbing, HVAC and Electrical Contracts Divisions, except as otherwise indicated.
4. Unless otherwise indicated, painting and coatings are not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, furred areas, pipe spaces, duct shafts, lift shafts.
5. Do not paint moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts, unless otherwise indicated.

1.3 REFERENCES

A. SSPC (The Society for Protective Coating) – Steel Structures Painting Manual

B. EPA (Environmental Protection Agency) Method 24

C. UL (Underwriters' Laboratories)

D. ASTM E 84 – Test method for Surface Burning Characteristics of Building Materials

E. OTC (Ozone Transport Commission)

F. Applicable state requirement for VOC (Volatile Organic Compounds)

1.4 DEFINITIONS

A. Sheen: Specular gloss readings in accordance with ASTM D52

1.	Flat	less than 5	(measured at 85 degrees)
2.	Eggshell	5-20	(measured at 60 degrees)
3.	Satin	15-35	(measured at 60 degrees)
4.	Low Luster	25-35	(measured at 60 degrees)
5.	Semi-Gloss	30-65	(measured at 60 degrees)
6.	Gloss	65 or more	(measured at 60 degrees)

1.5 SUBMITTALS

A. Product Data: Submit manufacturer’s descriptive product data for each paint and coating product finish system specified. Include block fillers and primers. Product data shall include the product name and number, product descriptive performance data, (generic classification or binder type), manufacturer’s stock number and date of manufacture, contents by volume for pigment and vehicle constituents, thinning, mixing, application and curing instructions, color name and number, and VOC content and . Submit certification on manufacturer’s letterhead certifying all paint and coating products being provided are in compliance with VOC requirements as required by all applicable local and state regulatory agencies with initial submittal and again at time of application. Submit manufacturer’s printed application instructions and methods, including mixing, surface preparation, compatible primers and topcoats, recommended wet and dry film thickness.

B. Prior to delivery of materials to the site, the Painting subcontractor shall submit for approval, the names and products of the manufacturer to be used. This list shall be on the manufacturer's letterhead and as detailed as the list specified below in Painting and Coating Schedule. The list shall include the specific brands of paints, coatings and finishes that will be provided for each differing surface, plus a statement that the products are suitable for the purposes intended and that they comply with the Specifications. This list shall identify where each product will be used within the project, and on what surface. Submission of manufacturer's materials list and certification of compliance shall receive Architect's approval and/or comment prior to ordering materials.

C. Colors and Samples: Colors shall be selected by the Architect. The Architect will furnish the Painting subcontractor a schedule of colors and locations of various colors.

1. Selected color may or may not be ready mixed colors. Painting subcontractor shall furnish all colors, whether ready mixed, intermixed or special. The Architect will not be restricted in number of colors selected.
2. Submit for Architect's preliminary approval two 6" x 8" stepped brush out samples defining each separate coat. First coat shall be 50% than specified finish coat color. Each succeeding coat shall be 50% lighter than specified finish coat color. Include block fillers and primers of each standard and intermix color selected in a step down fashion on a leneta display card by the approved painting and coating manufacturer and each color shall have manufacturer's identification designation thereon. Provide brush out samples on actual wood surfaces of the appropriate species for transparent finished woods.
3. Identify each sample with color name and number; and product name and number
4. Final acceptance of colors will be from samples applied on the job.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has complete painting and coating system applications similar in material and extent to that indicated for this Project with a record of successful in service performance. Applicator for textured systems shall be one who is approved by the textured system manufacturer for proper application of the system.

B. Source limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

C. Material application shall be applied under adequate illumination, evenly spread and smoothly applied, free of runs, sags, holidays, lap marks, air bubbles, and pin holes to assure a smooth finish.

D. Mock-Ups: Where directed provide a field sample 10 feet long by 10 feet wide (or ceiling height), completed door frame unit, as applicable, in each paint system specified. Modify as directed until accepted.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the job site in original unbroken sealed containers with manufacturer’s labels intact and in strict accordance with manufacturer's written recommendations. Each container shall be inspected and approved prior to being opened for use. Maintain containers in clean condition, free of foreign materials and residue.

B. Take every precaution against fire. Store materials in tightly covered containers, in a well ventilated locked area with ambient temperatures continuously maintained at not less than 45 deg. F and in accordance with manufacturer’s written requirements. Keep rags, waste, debris, and materials which may constitute fire hazard in water-filled closed, tightly covered, properly labeled, metal containers for daily removal. If tarpaulins are used, they shall be kept neat and no smoking shall be permitted within the space. Provide and maintain proper Class C hand fire extinguishers in the immediate area and all personnel shall be instructed in their use and informed of their location.

C. Take every precaution against the hazards of fume inhalation. Keep all areas well ventilated at all times. Where natural ventilation is insufficient to provide suitable conditions, provide special fans. If necessary, provide suitable face masks for mechanics.

1.8 PROJECT CONDITIONS

A. Apply paints and coatings only when temperature of surfaces to be painted or coated and surrounding air temperatures is above 50 and below 90 deg F, unless otherwise permitted by and in accordance with manufacturer's printed instructions.

B. Do not apply paint and coatings in snow, rain, fog, mist, or when relative humidity exceeds 70 percent and the surface temperature is at least 5 deg, F above the dew point. Prevent wide variation of temperature that might result in condensation on freshly coated surfaces.

C. Provide adequate continuous ventilation and sufficient heating facilities to maintain temperatures above 50 deg. F for 24 hours before, during and 48 hours after application of finishes.

D. Painting and coating work may be continued during inclement weather if areas and surfaces to be finished are enclosed and heated within temperature and ambient limits specified by the manufacturer during application and drying periods.

E. Take moisture readings of surfaces to be finished on a daily basis with a reliable electronic moisture meter and record moisture readings. Moisture content shall not vary more than the amount allowed by the paint manufacturer's written requirements and recommendations.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional (2) percent, but not less than 1 gal. of each material and color applied.

2. Label each container with color, type, gloss and room locations in addition to manufacturer's clear and unobstructed label.

PART 2 - PRODUCTS

2.1 MANUFACTURER'S QUALITY

A. Materials shall be the highest quality grade (first line architectural), products of their respective kinds. Primers, stains and finish(es) of each coating system shall be of the same manufacturer.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following, or approved eequivalent.

1. Benjamin Moore
2. M.A.B.
3. PPG
4. Sherwin Williams
5. Or Approved Equivalent

C. Coatings for each system shall be the product of the same manufacturer to ensure compatibility of systems. Substitutions of equivalent products of other manufacturers may be submitted for approval providing the products submitted are of the same types, have label analyses similar to those specified, meet or exceed the performance criteria, and are suitable for the use intended as approved by the Architect.

D. Use thinning materials only as specified by manufacturer's labeled directions for each type of paint and coating. All coatings shall conform to all Federal, State and Local Regulations

including VOC rules and air quality standards in effect at the Project location at the time of application.

2.2 MATERIALS GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint, coating, finishing system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint, coating and finishing system, provide products recommended in writing by manufacturers of topcoat for use in paint, coating and finishing system and on substrate indicated.

B. VOC Content of Field-Applied Interior paints, primers, stains, and transparent finish coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints, primers, stains, and transparent finish coatings that are applied in a fabrication or finishing shop:

1. Primers and Undercoaters: VOC content of not more than 100 g/L.
2. Flat Paints, Coatings: VOC content of not more than 50 g/L.
3. Nonflat Paints, Coatings: VOC content of not more than 50 g/L.
4. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
5. Clear Wood Finishes, Varnishes: VOC not more than 275 g/L.
6. Clear Wood Finishes, Lacquers: VOC not more than 275 g/L.
7. Floor Coatings: VOC not more than 50 g/L.
8. Waterproofing Sealers: VOC not more than 250 g/L
9. Sanding Sealers: VOC not more than 275 g/L
10. All Other Sealers: VOC not more than 200 g/L
11. Shellacs, Clear: VOC not more than 730 g/L.
12. Shellacs, Pigmented: VOC not more than 550 g/L.
13. Stains: VOC not more than 100 g/L.

C. Colors: As indicated, or if not indicated, as selected by the Architect from manufacturers full range.

2.3 PAINTING AND COATING SCHEDULE

A. The following is a general guide for the finish painting required, but does not include every surface or material to be finished or painted. Paint schedule is based on each Manufacturer’s first line quality products. Substitution products shall be accompanied by manufacturer’s literature establishing evidence of the same; and interior products shall also be in compliance with VOC limits and shall not contain restricted Chemical Components described above.

B. Each of various undercoats of paint other than natural finishes to be a slightly different shade from the preceding coat stepping up to color selected in order to verify number of coats applied.

2.4 EXTERIOR PAINT AND COATING SCHEDULE

A. Exterior Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer. Touch up fabricator primer and spot coat.

1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a rust-inhibitive primer for Hollow Metal Doors and Frames, etc. for high use locations:

a. Prime Coat: 1 coat

1) Moorcraft Super Spec Alkyd Metal Primer (Z06).
2) S-W: Kem Bond HS Primer B50Z Series.
3) MAB: Rustolastic Anti-Corrosive Primer (073 line).
4) PPG: Speedhide Alkyd Metal Primer 6-208.
5) Or approved equivalent.

b. Finish Coats: 2 coats

1) Moorcraft Super Spec DTM Alkyd Gloss Enamel Z26.
2) S-W: Industrial Enamel HS, B54Z-400 Series.
3) MAB: Rustolastic Alkyd Finish Coating (074 line).
4) PPG: Alkyd Gloss Industrial Enamel 7-282 Series.
5) Or approved equivalent.

B. Galvanized Ferrous Metal: Provide the following finish systems over galvanized ferrous metal:

1. Semigloss, Acrylic Finish: Two finish coats over a primer.

a. Primer: As recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer.

1) Moore: Acrylic Metal Primer #M04.
2) S-W: DTM Acrylic Primer/Finish, B66W1 for galvanized steel.
3) MAB: Rustolastic Hydroprime Primer (073-189 line).
4) PPG: Pitt Tech DTM Acrylic Metal Primer 90-712.
5) Or approved equivalent.

b. 2 Finish Coats: Semigloss, at spreading rate recommended by the manufacturer.

1) Moore: DTM Acrylic SemiGloss #M29.
2) S-W: DTM Acrylic Coating B66.
3) MAB: Rust-O-Lastic Acrylic DTM (063 line).
4) PPG: Pitt Tech DTM Acrylic Satin Enamel 90-474 Series.
5) Or approved equivalent.

C. Exterior Exposed Block: New and previously painted surfaces unless specifically noted otherwise. Low Luster/Latex:

1. Prime Coat: 1 coat

a. Moore: Super Craft Latex Block Filler #285.
b. S-W: Loxon Block Surfacer, A24W200.
c. MAB: 1 coat Block Cote 2000 or 1000.
d. PPG: Speedhide Acrylic Block Filler 6-15.
e. Or approved equivalent.

2. Finish Coats: 2 coats

a. Moore: MoorGard Latex Low Luster Finish (103).
b. SW: A-100 Exterior Latex Satin A82 Series.
c. MAB: 2 coats Sea Shore Satin House Paint (060 line).
d. PPG: Speedhide Exterior Stain Acrylic House Paint 6-2045 Series.
e. Or approved equivalent.

2.5 INTERIOR PAINT AND COATING SCHEDULE

A. Interior Ferrous Metal: Provide the following finish systems over ferrous metal: For use at higher abuse areas such as metal doors and frame, trim, etc.

1. Semigloss, Latex Finish: Two finish coats over a primer.

a. Primer: Quick-drying, rust-inhibitive, metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer.

1) Moore: IronClad Latex Low Lustre Metal & Wood Enamel, (#363) VOC 380 g/L.
2) MAB: Rust-O-Lastic Hydro Prime, (073 line), VOC 100 g/L.
3) PPG: Pitt-Tech DTM Industrial Enamel, Acrylic Primer 90-712, VOC 123 g/L.
4) Or approved equivalent.

b. Finish Coats: Semi-Gloss, latex, applied at spreading rate recommended by the manufacturer.

1) Moore:Eco Spec Interior Latex Semi-Gloss Enamel, (#224), VOC 11 g/L.
2) MAB: EnviroPure Latex Semi-Gloss, (047 line), VOC 0g/L.
3) PPG: Pure Performance Semi-Gloss Latex, 9-500 Series, VOC 0 g/L.
4) Or approved equivalent.

B. Interior Plaster and Drywall: General Use Unless specifically noted otherwise, Eggshell Finish/Latex:

1. Eggshell, Latex Finish: Two finish coats over a primer.

    a. Prime Coat: 1 coat New wall surfaces:

        1) Moore: EcoSpec Interior Latex, Primer Sealer (231), VOC 0 g/L.
        2) MAB: EnviroPure Latex Primer, (037-195), VOC 12 g/L.
        3) PPG: Pure Performance, Interior Latex Primer, Series 9-900, VOC 0 g/L.
        4) Or approved equivalent.

    b. First and Second Coats: Eggshell, applied at spreading rate recommended by the manufacturer

        1) Moore: EcoSpec Interior Latex Eggshell Enamel (223), VOC 1 g/L.
        2) MAB: EnviroPure Latex Eggshell Enamel, (045 line), VOC 10 g/L.
        3) PPG: Pure Performance, Interior Eggshell Latex, 9-300 Series, VOC 0 g/L.
        4) Or approved equivalent.

C. Interior Exposed Concrete Masonry Units: Office areas. Eggshell Finish/Latex:

1. Eggshell Finish: 2 finish coats over an undercoat and a filled surface at all interior masonry walls unless otherwise noted.

    a. Block Filler: High-performance, latex-based, block filler applied at spreading rate recommended by the manufacturer.

        1) Moore: EcoSpec Interior Latex, Primer Sealer (231), VOC 0 g/L.
        2) MAB: Block Kote #2000 (064-140), VOC 100 g/L.
        3) PPG: Speedhide Acrylic Block Filler 6-15, VOC 47.5 g/L.
        4) Or approved equivalent.

    b. First and Second Coats: (Eggshell), applied at spreading rate recommended by the manufacturer.

        1) Moore: Eco Spec Interior Latex Eggshell Enamel (223), VOC 1 g/L.
        2) MAB: EnviroPure Latex Eggshell Enamel, (045 line), VOC 10 g/L.
        3) PPG: Pure Performance, Interior Eggshell Latex, 9-300 Series, VOC 0 g/L.
        4) Or approved equivalent.

D. Interior Plaster and Drywall: (Subject to moisture) Kitchen, SemiGloss Latex Finish.

1. Semi-Gloss, Latex Finish: Two finish coats over a primer.

    a. Prime Coat: 1 coat New wall surfaces:

        1) Moore: Rich Lux Latex Sealer Undercoater (037-154), VOC 70 g/L.
        2) MAB: EnviroPure Latex Primer, (037-195), VOC 12 g/L.
        3) PPG: Pure Performance, Interior Latex Primer, Series 9-900, VOC 0 g/L.
        4) Or approved equivalent.

b. First and Second Coats: Semi-Gloss, applied at spreading rate recommended by the manufacturer

1) Moore: EcoSpec Interior Latex Eggshell Enamel (224), VOC 11 g/L.
2) MAB: EnviroPure Latex Semi-Gloss, (047 line), VOC 12 g/L.
3) PPG: Pure Performance, Interior Semi-Gloss Latex, 9-500 Series, VOC 0 g/L.
4) Or approved equivalent.

E. Interior Woodwork – Painted Finish: Wood Trim, Sills, etc., (Wood Doors are Prefinished). Semi Gloss/Latex Finish.

1. Semi-Gloss, Latex Finish: Two finish coats over a primer.

a. Prime Coat: 1 coat New wall surfaces:

1) Moore: EcoSpec Interior Latex, Primer Sealer (231), VOC 0 g/L.
2) MAB: EnviroPure Latex Primer, (037-195), VOC 12 g/L.
3) PPG: Pure Performance, Interior Latex Primer, Series 9-900, VOC 0 g/L.
4) Or approved equivalent.

b. First and Second Coats: Semi-Gloss, applied at spreading rate recommended by the manufacturer

1) Moore: EcoSpec Interior Latex Eggshell Enamel (224), VOC 11 g/L.
2) MAB: EnviroPure Latex Semi-Gloss, (047 line), VOC 12 g/L.
3) PPG: Pure Performance, Interior Semi-Gloss Latex, 9-500 Series, VOC 0 g/L.
4) Or approved equivalent.

2.6 MISCELLANEOUS

A. Miscellaneous Items:

1. Provide multiple colors, patterns, borders, fields and designs as indicated, or if not indicated, as selected by the Architect.
2. Items not specifically detailed or mentioned in specifications but necessary to be painted for proper completion of job, shall be painted in accordance with instructions from Architect.

PART 3 - EXECUTION

3.1 INSPECTION

A. Applicator shall examine areas and conditions under which painting work is applied and take moisture readings with a reliable electronic moisture meter in sufficient area in each space and

as often as necessary to determine the proper moisture content for application and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Applicator and in accordance with paint manufacturer's written requirements for surface preparation. Starting of painting work will be construed as Applicator's acceptance of such faces and conditions within any particular area.

3.2 SURFACE PREPARATION

A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's written instructions and recommendations and as herein specified, for each particular substrate condition.

B. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations.

C. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed item.

D. Contractor shall prepare all surfaces, walls, ceilings, metal frames, etc., which are to be painted, including but not limited to, scraping, sanding, spackling, patching etc. as necessary to remove loose particles, paint, mildew, greasy residue, splatters, burrs, graffiti, surface decals, surface applied texture materials, mastic, glue, etc. Repoint and/or spackle holes, voids, defects, etc. to form a smooth level surface. Remove nails, screws, anchors and the like. Sand existing metal frames, etc. to smooth out edges of various paint layers.

E. Clean surfaces to be painted before applying paint or surface treatments. Remove dirt, oil and grease using an oil and grease emulsifier such as Moore's M83, or approved equivalent in accordance with SSPC-SPI Method B2 prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly painted surfaces.

F. Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated of oil, grease, dirt loose mill scale and other foreign substances by solvent or mechanical cleaning (SSPC – SP-1).

G. Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum base solvent and artificial abrasive pad.

3.3 MATERIALS PREPARATION

A. Mix and prepare painting materials in accordance with manufacturer's directions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and if necessary, strain material before using.

3.4 APPLICATION

A. General: Apply paint in accordance with manufacturer's written instructions and recommendations. Use applicators and techniques best suited for substrate and type of material being applied. Apply according to recommended dry film thickness and recommended square foot per gallon.

B. Apply materials under adequate illumination, evenly spread and smoothly applied, free of runs, sags, holidays, lap marks, air bubbles, and pin holes to assure a smooth finish.

C. Apply additional coats when undercoat, stains or other conditions show through final paint coat, until paint film is of uniform finish, color and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces. Deep color base primers are to be used under deep finish colors to achieve proper color appearance.

D. Paint surfaces behind moveable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.

E. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.

F. Sand lightly all abrasions and damaged spots, between each succeeding enamel, varnish coat, textured paint coat, and degloss previous painted surfaces if necessary. Spot prime water soluble stains. Reprime prior to applying finish coats as required.

G. Omit first coat (primer) on metal surfaces that have been shop primed- and touch-up painted, unless otherwise indicated. Bare areas are to be spot primed.

H. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

I. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the under coat.

J. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.

K. Prime Coats: Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others. Prime coats shall be of the same manufacturer as the top coat.

L. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

M. Pigmented (Opaque) Finished: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.

N. Provide satin finish or semi-gloss for final coats as indicated in the painting schedule, unless otherwise indicated.

O. Guarantee: Manufacturer shall warrant material to conform to specification and be free of manufacturing defects for a period of one year. Applicator will guarantee that its installation of materials conforms to manufacturer's recommendations shall further guarantee its workmanship connected with the installation for a period of one year from the date of installation.

P. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

Q. Touch-up work: Touch-up work shall be the responsibility of the Painting Subcontractor.

3.5 CLEAN-UP AND PROTECTION

A. Clean-up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.

B. Upon completion of painting work, clean window glass, plumbing fixtures, etc., and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting as acceptable to Architect.

D. Provide ***'Wet Paint'*** signs as required to protect newly painted finishes. Remove temporary protective wrappings provided for protection of their work, after completion of painting operations.

E. At completion of work of other trades, Painting Subcontractor shall touch-up and restore all damaged or defaced painted surfaces.

END OF SECTION 099000

SECTION 101418 - SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

A. Provide all labor, materials, accessories, equipment and incidentals to provide signs and plaques as indicated including, but not limited to, the following:

1. Interior Permanent Panel Plaques.
2. Exterior Truss Construction Identification Emblem.
3. Dimensional Characters (letters, numbers, logos)

B. Provide identification plaque at each new and existing interior door opening to each interior space and as indicated on the drawings.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature, specifications and installation instruction for each type of sign required.

B. Shop Drawings: Submit shop drawings for fabrication and erection of specialty signs. Include plans, elevations, dimensions, large-scale details, sign locations, field measurements, wording, lettering, artwork and braille layout. Show attachment to other work, field dimensions and accessory items. Furnish location template drawings for items supported or anchored to permanent construction. Obtain Owner’s or Architect’s written approval of sign text prior to fabrication of signs.

C. Samples: Submit samples of each color and finish of exposed materials and accessories required for specialty signs. Architect's review of samples will be for color and texture only. When requested, furnish full-size samples of specialty signs materials.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Provide raised image tactile signs in compliance with code provisions of ICC/ANSI A117.1 and The Americans with Disabilities Act (ADA). Provide Identifying Emblems in compliance with N.J.A.C. 5:23-3.5(e) to identify the building as having floor, roof or both roof and floor trusses.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Panel Signs: Subject to compliance with requirements, manufacturers of panel signs that may be incorporated in the work include, but are not limited to, Best Sign Systems, Inc., (Basis-of-Design) or approved equal.

B. Dimensional Characters: Subject to compliance with requirements, manufacturers of metal dimensional characters that may be incorporated in the work include, but are not limited to, A.R.K. Ramos (Basis-of-Design) or approved equal.

2.2 INTERIOR PLAQUES

A. Materials: Interior plastic plaques shall be a durable, two color, scratch resistant, non-static, fire retardant, washable melamine surface laminate with non-glare surface and tough colored phenolic core painted a contrasting color after artwork has been carved into the surface and providing raised lettering and braille. Subject to compliance with requirements, manufacturers of products that may be incorporated in the work include, but are not limited to, iSign Architectural Signage, Non-Combustible or self-extinguishing type (Basis-of-Design) or approved equal.

1. Material thickness: 1/4 inch.
2. Weight: 2 lbs./sq. ft.
3. Flexural strength flat: 25,000 p.s.i.
4. Tensile strength: 22,000 p.s.i.
5. Compressive strength flat: 47,000 p.s.i.
6. Shear strength: 16,800 p.s.i.
7. Dielectric strength short time (D229 Test): 330 volts/Mil
8. NEMA Rated “self-extinguishing”.

B. Requirements of All Interior Permanent Room Plaques shall comply with the following provisions for compliance with ICC/ANSI A117.1 and ADA:

1. Characters shall be raised 1/32 inch.
2. Characters shall be upper case and sans serif or "simple serif" type style, as selected by the Architect.
3. Characters shall be accompanied by Grade 2 Braille.
4. Raised characters shall be a minimum of 5/8 inch and a maximum 2 inch high with a width-to-height ratio of between 3:5 and 1:1, stroke width-to-height ratio of between 1:5 and 1:10 (based on upper case X).
5. Equivalent written description (if any) shall be placed directly below pictogram (symbol).
6. Pictograms shall be of sizes indicated on drawings or, if not indicated, with a minimum field of 6 inches in height. Provide pictograms at Accessible Toilet room doors, accessible toilet stalls, accessible entrances, directional signage, stair/elevator instructional signage, etc. as indicated and as required for code compliance.

7. Pictograms shall be raised 1/32 inches, block Type with sharply defined edges, with at least one quarter inch stroke width (if incised).
8. Characters and background shall be eggshell, matte or other non-glare finish.
9. Characters shall contrast with background (either light on dark or dark on light).
10. Signs shall be located on the wall adjacent to the latch side of the door. (If wall space is inadequate or at double leaf doors, mount signs at nearest adjacent wall).
11. Mount using manufacturer's concealed theft resistant fasteners or other method acceptable to the Architect.
12. Mount sign so that a person can approach within 3" and avoid door swing and protruding objects.
13. Mounting height: Characters shall be 48 inches minimum and 60 inches maximum above adjacent finish floor or ground surface, measured from the base line of the characters.

C. Panel Sign Types:

1. Interior Room Identification Plaques (Provide one for each entry door per room in the scope of project work):

   a. Plaque shall match owner’s building / campus standard
   b. Size: 6” x 6” x 1/4” thick
   c. Plaque shall contain the room number in lettering and Braille.
   d. Text Height: 1-1/4”
   e. Braille: 3/8” below room number. Grade II, alignment centered.

2. Accessible Toilet Room Plaques: Shall be 6” x 8” containing the International Symbol of Accessibility together with gender pictogram and name as follows:
   a. Provide one sign at the outside of each entrance to accessible toilet rooms.

3. Color:
   a. Background: MP34412 Smoke Screen
   b. Text: MP55697 Bluest Blue LRV 6.8

2.3 EXTERIOR TRUSS CONSTRUCTION IDENTIFICATION EMBLEM

A. Identifying Emblem shall be made of 18 gauge bonderized steel. Emblem shall be of a bright and reflective color. Shape of the emblem shall be an isosceles triangle and the size shall be 12 inches horizontally by 6 inches vertically. The following letters, of a size and color to make them conspicuous, shall be printed on the emblem:

1. “R” to signify a roof with truss construction; or

2.4 EXTERIOR DIMENSIONAL CHARACTERS (Letters and/or Numbers)

A. Letters and/or logos shall be non-illuminated, sized as per elevation drawings, by 2” deep in upper case font fabricated from .090” thick architectural aluminum sheets with joints hilliarc welded. Letters shall be completely sanded, etched and degreased by immersion process to receive baked enamel finish in color selected by the Architect. Letters shall be attached to the

building using aluminum “L” brackets with plastic spacers to separate letters from wall surface. Attach at solid blocking concealed between studs behind wall system with aluminum or stainless steel studs and anchors as recommended by the manufacturer. Text shall be as indicated on drawing or as otherwise provided by the Owner. Allow for quantity of letters and logos shown.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items provided under other sections of Work are sized and located to accommodate signs.

C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sign units and components at locations shown or scheduled, securely mounted with concealed theft-resistant fasteners, unless otherwise indicated. Attach signs to substrates in accordance with manufacturer's instructions.

B. Install level, plumb, and at proper height. Cooperate with other trades for installation of sign units to finish surfaces. Repair or replace units as directed by Architect.

C. Location of room and capacity plaques to be mounted with characters 48 inches minimum and 60 inches maximum above the adjacent finished floor or ground surface measured from the baseline of the characters on wall next to door on the latch side when door is closed. When a tactile sign is provided at double doors, the sign shall be to the right of the right hand door. Where there is no space on the latch side of a single door, or the right side of double doors, signs shall be on the nearest adjacent wall. Signs containing tactile characters shall have an 18 inch minimum by 18 inch minimum space on the floor or ground centered on the sign, beyond the arc of any door swing between the closed position and 45 degree open position.
   1. Exception: Door mounted signs shall be permitted on the push side of the doors without closers and without hold-open devices.

D. Location of Truss Identifying Emblem shall be permanently affixed to the left of the main entrance door at a height of between four and six feet above the ground.

E. Apply plaques in strict compliance with the manufacturer's printed recommendations. Clean all surfaces exposed to view before final completion.

F. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:

1. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.

G. Dimensional Characters: Mount characters using standard fastening methods recommended in writing by manufacturer for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.

1. Flush Mounting: Mount characters with backs in contact with wall surface.
2. Projected Mounting: Mount characters at projection distance from wall surface indicated.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 101418

SECTION 102800 - TOILET 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 DESCRIPTION OF WORK

A. Extent of each type of toilet accessory is shown on drawings and scheduled herein.

B. All operating devices to comply with ADA and to ICC/ANSI A117.1 requirements for mounting heights and operating force.

1.3 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

C. Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas, unless otherwise acceptable to Architect.

D. Manufacturer: Provide each type of toilet accessory required by a single manufacturer as manufactured by Bradley Corp. or approved equal.

E. Grab Bar Design Criteria: Design grab bars and components which, when installed, comply with ASCE 7, Section 4.4 “American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures” and with the following minimum structural performance requirements for loads:

1. Grab bar systems shall be designed to resist a single concentrated load of 250 lb. applied in any direction at any point.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory.

B. Setting Drawings: Provide setting drawings, templates, instructions and directions for installation of anchorage devices in other work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22 gage minimum, unless otherwise indicated.

B. Brass: Leaded and unleaded, flat products, FS 00-B-613, ASTM B-19, Rods, shapes, forging and flat products with finished edges, FS 00-B-626, ASTM B-16, Castings, ASTM B-30.

C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 20 gage minimum, unless otherwise indicated. Surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 527, G60.

E. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC-2.

F. Annealed Monolithic Glass: Mirror Select Quality, ultraclear (low-iron) float glass with a minimum 91 percent visible light transmission, 1/4" thick, tempered, with silver coating, copper protective coating, and non-metallic paint coating.

G. Galvanized Steel Mounting Devices: ASTM A 386, hot-dip galvanized after fabrication.

H. Fasteners: Screws, bolts and other devices of same material as accessory unit or of galvanized steel where concealed.

2.2 FABRICATION

A. General: Stamped names or labels on exposed faces of toilet accessory units are not permitted, except where otherwise indicated.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous piano hinge or minimum of two 1-1/2” pin hinges of the same metal as unit cabinet. Provide concealed anchorage wherever possible.

2.3 ACCESSORY SCHEDULLE

A. A toilet accessory schedule is included within the Architectural Drawings as an extension of this Specification Section.

B. Basis-of-Design: Bobrick Washroom Equipment; or approved equivalent.

2.4 LAVATORY PIPING PROTECTION

A. Provide soft flexible vinyl antimicrobial insulation with weep holes to fit tubular under sink pipes, P-Traps, offset strainers, valves, etc. for the protection of wheel chair users while still allowing access for servicing as manufactured by Truebro, Inc. (Lav-Guard) or approved equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. Installer must examine substrates, previously installed inserts and anchorages necessary for mounting of toilet accessories and other conditions under which installation is to occur and must notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.

3.2 INSTALLATION

A. Install toilet accessory units in accordance with manufacturer's instructions, using concealed anchors, fasteners, etc. as required, which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and leave, firmly anchored in locations indicated

3.3 ADJUST AND CLEAN

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly.

B. Clean and polish all exposed surfaces after removing protective coatings.

END OF SECTION 102800

SECTION 104416 - FIRE EXTINGUISHERS

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. Portable, hand-carried fire extinguishers.
2. Mounting brackets for fire extinguishers.

B. Related Requirements:

1. Section 104413 "Fire Protection Cabinets."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations where indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate, install and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers" and ICC/ANSI A117.1.

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Available Manufacturers:

a. Larsen’s Manufacturing Company (Basis of Design).
b. JL Industries.
c. Potter Roemer.
d. Or approved equal.

2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated, 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

1. Larsen’s MP-10 Series or approved equal.

2.3 MOUNTING BRACKETS (FE)

A. Mounting Brackets: Manufacturer's standard steel bracket, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

1. Larsen’s B-2 Bracket, or approved equal.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

a. Orientation: Vertical.
b. Equal to JL Industries Model #LDHRFE, 7-1/8”x2-1/4” decal or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: 44 inches above finished floor to handle assembly, or as indicated on drawings.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 105113 - METAL LOCKERS

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. All welded lockers

1.3 ACTION SUBMITTALS

A. Product Data: For each type of metal locker.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.

B. Shop Drawings: For metal lockers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Show locker trim and accessories, including filler, base and trim.
3. Show locations of built-in soffits or other construction where indicated on drawings.
4. Include locker identification system and numbering sequence.
5. identify accessible locker locations on drawings.

C. Samples for Initial Selection: Manufacturer's metal color samples matching material used for fabrication of lockers, showing the full range of colors available.

D. Product Schedule: For lockers. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Full-size units of the following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than five (5) units:

a. Identification plates.
b. Hooks.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

B. Deliver master and control keys and combination control charts to Owner's Representative by registered mail or overnight package service with copy of transmittal to Architect.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.9 COORDINATION

A. Coordinate sizes and locations of concrete bases for metal lockers.

B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.

b. Faulty operation of latches and other door hardware.

2. Damage from deliberate destruction and vandalism is excluded.
3. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Substantial Completion.
4. Warranty Period for Welded Metal Lockers: (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain metal lockers, and accessories from single source from single locker manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions of ADA and ICC/ANSI-A117.1, latest adopted versions.

2.3 WELDED ATHLETIC LOCKERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Republic Storage Systems or comparable product by one of the following:

1. PENCO Products, Inc., Vanguard Series.
2. Hadrian Manufacturing Inc.
3. List Industries Inc.

B. Perforated Doors: One piece; fabricated from 0.075-inch (1.90-mm) nominal-thickness steel sheet with manufacturer's standard diamond perforations; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges and [latch point (bottom) and right-angle single bend at remaining edges for box lockers.

1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches (381 mm) wide; welded to inner face of doors.

C. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:

1. Tops and Bottoms: 0.060-inch (1.52-mm) nominal thickness, with single bend at edges.
2. Backs: 0.060-inch (1.52-mm) nominal thickness.
3. Shelves: 0.060-inch (1.52-mm) nominal thickness, with double bend at front and single bend at sides and back.

D. Unperforated Sides: Fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet.

E. Perforated Sides: Fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet with manufacturer's standard diamond perforations.

F. Frames: Channel formed; fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet or 0.097-inch (2.45-mm) nominal-thickness steel angles; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.

1. Cross Frames for Double-Tier Lockers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.

G. Reinforced Bottoms: Structural channels, formed from 0.060-inch (1.52-mm) nominal-thickness steel sheet; welded to front and rear of side-panel frames.

H. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.

1. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum 2 inches (51 mm) high. Provide no fewer than three hinges for each door more than 42 inches (1067 mm) high.

I. Recessed Door Handle and Latch: Stainless -steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.

1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in cylinder locks, or padlocks; positive automatic latching and prelocking.

a. Latch Hooks: Equip doors 48 inches (1219 mm) and higher with three latch hooks and doors less than 48 inches (1219 mm) high with two latch hooks; fabricated from 0.120-inch (3.04-mm) nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

J. Door Handle and Latch for Box Lockers: Stainless steel strike plate with integral pull; with steel padlock loop that projects through metal locker door.

K. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch (9 mm) high.

L. Hooks: Manufacturer's standard ball-pointed, aluminum or steel; zinc plated.

M. Continuous Sloping Tops: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet, with a pitch of approximately 20 degrees.

1. Closures: Vertical end type.

N. Recess Trim: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet.

O. Filler Panels: Fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet.

P. Boxed End Panels: Fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet.

Q. Finished End Panels: Fabricated from 0.024-inch (0.61-mm) nominal-thickness steel sheet to cover unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

R. Materials:

1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.

S. Finish: Baked enamel or powder coat.

1. Color: As selected by Architect from manufacturer's full range.

2.4 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.

C. Equipment: Provide each locker with an identification plate and the following equipment:

1. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.
2. Coat Rods: As indicated on Drawings.

D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.

E. Accessible Lockers: Fabricate as follows:

1. Locate bottom shelf no lower than 15 inches above the floor.

2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.

F. Continuous Base: Formed into channel or zee profile for stiffness, and fabricated in lengths as long as practical to enclose base and base ends of metal lockers; finished to match lockers.

G. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.

1. Sloping-top corner fillers, mitered.

H. Recess Trim: Fabricated with minimum 2-1/2-inch face width and in lengths as long as practical; finished to match lockers.

I. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

J. Boxed End Panels: Fabricated with 1-inch wide edge dimension, and designed for concealing fasteners and holes at exposed ends of non-recessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

K. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of non-recessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

L. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

2.5 ACCESSORIES

A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

B. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls for corrosion resistance.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
2. Anchor single rows of metal lockers to walls near top and bottom of lockers. Anchor to floors only where locker bases are provided.

B. Welded Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.

C. Equipment:

1. Attach hooks with at least two fasteners.
2. Attach door locks on doors using security-type fasteners.
3. Identification Plates: Identify metal lockers with identification to be coordinated with Owner.

    a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
    b. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.

D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach recess trim to recessed metal lockers with concealed clips.
2. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
3. Attach sloping-top units to metal lockers, with closures at exposed ends.
4. Attach boxed end panels using concealed fasteners to conceal exposed ends of non-recessed metal lockers.
5. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of non-recessed metal lockers.

3.3 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. If applicable, verify that integral locking devices operate properly.]

3.4 PROTECTION

A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers.

1.3 SUBMITTALS

A. Product Data: For each type of product.

1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples for Verification: For each type of roller shade.

1. Shadeband Material: Not less than 3 inches square. Mark inside face of material if applicable.
2. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.
3. Installation Accessories: Full-size unit, not less than 10 inches long.

D. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.4 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. Provide the following:

1. Beaded Chain: 30 linear feet.
2. Chain Retainers: Five units for each retainer type installed.
3. Mounting Hardware: Three sets for each mounting type installed.
4. Limit Stops: Ten, ball type stops to match types installed.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.7 FIELD CONDITIONS

A. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 WARRANTY

A. Warranty: Provide manufacturer's standard warranties, including the following:

1. Roller Shade, Hardware and Shadeband: Manufacturer's standard non-depreciating twenty-five year limited warranty.
2. Roller Shade Installation: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers of products that may be include in the work include, but are not limited to the following, or approved equal:

1. MechoShade Systems, Inc.
2. Draper, Inc.
3. Rollease, Inc.

B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS (RS-1)

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Nickel-plated metal.

    a. Loop Length: Full length of roller shade.
    b. Limit Stops: Provide upper and lower ball stops.
    c. Chain-Retainer Type: Clip, jamb mount; Chain tensioner, jamb or sill mounted.

2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.

    a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criteria are more stringent.

B. Spring Operating Mechanisms: Roller contains spring sized to accommodate shade size indicated. Provide with positive locking mechanism that can stop shade movement at each half-turn of roller and with manufacturer's standard pull.

1. Pole: Manufacturer's standard type in length required to make operation convenient from floor level and with hook for engaging pull.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of inside face of shade.
2. Direction of Shadeband Roll: Regular, from back of roller.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

F. Shadebands:

1. Shadeband Material: Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

    a. Type: Enclosed in sealed pocket of shadeband material.
    b. Color and Finish: As selected by Architect from manufacturer's full range.

G. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

    a. Shape: L-shaped.

b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 4 inches.

2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.

a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than 4 inches.

3. Endcap Covers: To cover exposed endcaps.
4. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.

a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than 4 inches.
b. Provide pocket with lip at lower edge to support acoustical ceiling panel.

5. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.

a. Closure-Panel Width: Manufacturer's standard width to cover recess or pocket, but no less than 2 inches.

6. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
7. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
8. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

1. Source: Roller-shade manufacturer / Mecho Ecoveil.
2. Type: 4-ply laminated fiberglass (3 ply PVC, 1 ply fiberglass).
3. Weave: Mesh.
4. Weight: 12 oz./sq. yd..
5. Roll Width: Roll width as required to fit openings.
6. Orientation on Shadeband: Up the bolt.
7. Openness Factor: Less than 3%.
8. Color: As selected by Architect from manufacturer's full range.

2.4 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than [1:4], provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 122413

SECTION 123216 –MANUFACTURED PLASTIC-LAMINATE-FACED CASEWORK

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 DESCRIPTION OF WORK

A. Provide all plant, labor, materials, accessories, equipment, and incidentals to complete fabrication and installation of built-in plastic laminate casework, countertops, and related necessary items as shown and specified herein. Casework shall be pre-engineered, and catalogued to rigid-matrix sizing allowing for future interchange of components, or entire units.

1.3 QUALITY ASSURANCE

A. Quality Standard: Unless otherwise indicated, engineer casework and installation to comply with AWI's "Architectural Woodwork Quality Standards" Sections 1600 and 1700.

B. Accessible casework shall be in conformance with: Applicable sections of the IBC International Building Code 2018, ICC/ANSI A117.1, and the Americans with Disabilities Act.

1.4 SUBMITTALS

A. Product Data: Submit manufacturers catalogued product data for each product indicated.

B. Shop Drawings: Submit engineered shop drawings complying with AWI's "Architectural Woodwork Quality Standards" Sections 1600 and 1700 and showing location and layout of each item, dimensioned plans and elevations, large scale details, cross sections, fillers, joints, attachment devices, cabinet-cut details, sink locations, coordination with plumbing, heating, and electrical work provided under other Contracts, and other components:

1. Indicate all related adjacent work of surrounding walls, doors, windows, heating units and diffusers, piping, electrical work and other building components.
2. Indicate requirements for furring blocking grounds, support required to be provided under other Specification Sections to adequately support the work.
3. Indicate all required field measurements.
4. Coordinate production drawings with other work involved.

C. Submit samples of decorative laminate colors, patterns and textures for exposed and semi-exposed materials and edges for Architect's selection from manufacturer's full color palette.

Submit one unit of each type of hardware or other materials and finishes for Architect's selection.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Protect casework during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver casework until painting, wet work, grinding, and similar operations that could damage, soil or deteriorate casework have been completed in installation areas.

1.6 JOB CONDITIONS

A. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for casework installation areas as designed and for the intended use. Do not install casework until required temperature and relative humidity have been stabilized and will be maintained in installation areas.

1.7 GUARANTY/WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of casework that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Delamination of components or other failures of glue bond.
b. Warping of components.
c. Failure of operating hardware.

B. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACUTERS

A. Source Limitations: Obtain plastic-laminate-faced cabinets from single manufacturer.

2.2 QUALITY STANDARD

A. Quality Standard: Unless otherwise indicated, comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" for grades of casework indicated for construction, finishes, installation, and other requirements.

1. Grade: Custom.

2. Provide certificates from AWI certification program indicating that casework complies with requirements of grades specified.

2.3 BASIC MATERIAL AND FABRICATION METHODS

A. General: Except as otherwise indicated, comply with following requirements for architectural casework with flush overlay door and drawer fronts fully modular and dimensionally integrated to allow Owner interchanging of doors, drawers, and interior components.

B. Definitions commonly used in defining decorative laminate clad casework parts by surface visibility:

1. Open Interiors: Any open storage unit without solid door or drawer fronts and units with full glass doors.
2. Closed Interiors: Any closed storage unit behind solid door or drawer fronts, glass insert doors, sliding solid doors, and/or acrylic doors.
3. Exposed Ends: Any storage unit exterior side surface that is visible after installation.
4. Other Exposed Surfaces: Faces of doors and drawers when closed, tops of cabinets less than 72” above finished floor.
5. Semi-Exposed Surfaces: Interior surfaces which are visible, bottoms of wall cabinets and tops of cabinets 72” or more above finished floor.
6. Concealed Surfaces: Any surface not normally visible after installation.

C. Particleboard: Medium density 45-50 pound industrial grade particleboard of fir or pine meeting or exceeding ANSI A 208.1, M-3 requirements.

D. Hardboard: 1/4” thick prefinished hardboard meeting or exceeding commercial standards CS-251.

E. Laminated Plastics/Finishes: High pressure plastic laminate for exterior cabinet surfaces shall meet NEMA LD3-2005 Exterior Glue and GP28 (.028) standards and shall be balanced with CL20 (.020”) high pressure cabinet liner for closed interiors.
1. Basis of Design Laminate: Wilsonart High Wear Laminate, or approved equivalent
2. Product Type: 107HW General Purpose
3. UL GREENGAURD Certified
4. Class II/B ASTM E-84
5. Finish #60 Matte Finish

F. Plastic Laminate Components for Closed Interiors: Thermally fused melamine laminate tested to meet NEMA LD 3 standards.

G. Door/Drawer Edging: 3mm thick PVC. Solid, high impact, purified, color-thru, acid resistant, PVC edging machine-applied with waterproof hot melt adhesives, automatically trimmed for uniform appearance, buffed 1/8” machine and corner-radiused for consistent design. Use for door/drawer, cabinet vertical end panel and shelving front edges.

H. Cabinet Body Edges: 1mm thick PVC banding, machine applied with waterproof hot melt adhesives, color matched to door/drawer face laminate.

I. PVC banding shall be available in all of manufacturer's available colors to match basic cabinet body color selected, or in contrasting solid colors as selected by the Architect.

J. Hardware:

1. Hinges: Frameless Concealed Hinges (European Type): BHMA A156.9, Type B01602, 135 degrees of opening**,** self-closing. Provide two hinges for doors less than 48 inches (1220 mm) high, and provide three hinges for doors more than 48 inches (1220 mm) high.
2. Pulls: Door and drawer front pulls shall be aluminum wire pulls, #DP07, anodized finish. Pull design shall be compatible with Americans with Disabilities Act (ADA), Federal Register Volume 56, No. 144, specifically paragraph 4.27.4. Other pulls may be acceptable pending Architect approval.
3. Drawer Slides: Shall be Blum Style No. BS230M with epoxy finish. Slides will have a 100 pound load rating at full extension and a built-in, positive stop both directions, with self closing feature. Slides shall have a lifetime warranty as offered by the slide manufacturer.
4. Adjustable Shelf Supports: Shall be injection molded polycarbonate, clear color to blend with selected interior finish, friction fit into cabinet end panels and vertical dividers, readily adjustable on 32 mm (approximately 1-1/4") centers. Each shelf support shall have two (2) integral support pins, to interface pre-drilled holes, and to prevent accidental rotation of support.

2.4 FABRICATION

A. Fabricate casework to dimensions, profiles, and details shown.

B. Cabinet Body Construction:

1. Tops and bottoms shall be joined to cabinet ends and internal cabinet components such as fixed horizontals, rails and verticals shall be joined using 10 mm diameter industrial grade hardwood dowels, laterally fluted with chamfered ends, securely glued and clamped under pressure during assembly to secure joints and cabinet square. Use minimum of six (6) dowels at each joint for 24" deep cabinets, a minimum of five (5) dowels at each joint for 18" deep cabinets and a minimum of four (4) dowels at each joint for 12" deep cabinets.
2. Unless specifically indicated, core shall be 3/4" thick particleboard. Edging and surface finishes as indicated herein.
3. Concealed unit backs shall be 1/4" thick hardboard prefinished and color matched to cabinet interior.
4. Exposed back on fixed cabinets to be 3/4" particleboard, color matched to cabinet interior, exterior surface GP28 laminate as selected.
5. All fixed base units shall have an individual factory-applied base constructed of 3/4" thick exterior grade plywood. Provide 96 mm (nominal 4") high toe base unless otherwise indicated on the drawings.
6. All end panels and vertical dividers, except sink base units, shall be prepared to receive adjustable shelf hardware at 32 mm (approximately 1-1/4") centers. Door hinges and

drawer slides shall mount on line boring to maintain vertical alignment of components and provide for future relocation of doors, drawers, or shelves.

7. All exposed and semi-exposed edges of basic cabinet components shall be factory edged with PVC banding, machine applied with waterproof hot melt adhesive.

    a. Edging shall be 1 mm PVC, to match door/drawer face laminate.

8. Adjustable shelf core shall be 3/4" thick particleboard up to 30" wide.

    a. Front edge shall have factory applied 1 mm PVC to match interior cabinet color.

C. Interior Finish, Units with Closed Interiors:

1. Shall be faced with high-pressure cabinet liner in light color beige, gray or white CL20 (.020").

D. Exposed Ends:

1. Shall be faced with high pressure decorative laminate GP28 (.028) color from casework manufacturer's full range of available colors.

E. Wall Unit Bottom:

1. Shall be faced with thermally fused melamine laminate. Match color of cabinet interior.

F. Wall Unit Tops:

1. The top edge of all wall unit end panels shall be factory edged with 1 mm PVC to match basic cabinet body color; raw edges at top of wall and tall end panels will not be permitted.
2. Top surface will be laminated with melamine to match basic body color.

G. Balanced construction of all laminated panels is mandatory. Unfinished core stock, even on concealed surfaces, will not be permitted.

H. Door/Drawer Fronts:

1. Core for all doors and applied drawer fronts shall be 3/4" thick particleboard. All edges shall be finished as indicated herein.
2. Double doors shall be used on all cabinets in excess of 30" wide.
3. Exterior faces shall be laminated with high wear high-pressure decorative laminate as described in Paragraph 2.3.E. Interior face shall be high-pressure cabinet liner in light color beige, gray or white CL20 (.020").

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

A. Installer must examine substrate and conditions under which work is to be installed and notify General Contractor in writing of unsatisfactory conditions. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. The installer must coordinate interface conditions between architectural casework and the work of other trades for blocking within walls, plumbing, ductwork, electrical work and the like.

C. Condition casework to average prevailing humidity conditions in installation area prior to installing.

3.2 INSTALLATION

A. Install casework in accordance with AWI's "Architectural Woodwork Quality Standards" Section 1700. Erect the work plumb, level true and straight with no distortions, shim as required using concealed shims.

B. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

C. Anchor casework to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners plugged to match and blind nailing as required for a complete installation.

D. Cabinets: Install without distortion so that 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 the installation of hardware and accessory items as indicated.

E. Tops: Anchor securely to base units and other support systems as indicated.

3.3 ADJUSTMENT, CLEANING AND PROTECTION

A. Repair or remove and replace damaged and defective casework as directed upon completion of installation.

B. Clean laminate casework surfaces on exposed and semi-exposed surfaces. Repair minor damage per plastic laminate manufacturer's recommendations. Replace other damaged parts or units.

END OF SECTION 123216

SECTION 123661- SIMULATED STONE COUNTERTOPS AND SILLS

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 DESCRIPTION OF WORK

A. Provide all labor, materials, accessories, equipment and incidentals to complete solid surface polymer fabrication work as required including, but not limited to, the following:

1. Countertops for Architectural Casework.
2. Window Sills (stools and aprons).

B. Related Work Specified Elsewhere:

1. Section 061000 “Rough Carpentry”.
2. Section 079000 “Joint Sealants”.
3. Section 092611 “Gypsum Board Assemblies”.

1.3 SUBMITTALS

A. Product Data: Manufacturer’s published product literature including product description, specifications, illustrated details, material safety data sheets, fabrication information and compliance with specified performance requirements.

B. Shop Drawings: Showing layout, elevations, dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work, required clearances.

C. Samples: Submit minimum 3” deep x 6” long sample of window stool with laminated bullnose edge. Indicate full range of color and pattern variation. Approved samples will be retained as standards for work. Submit sample section showing top and corner of two sides with finished joint conditions.

D. Maintenance Data: Submit manufacturer’s care and maintenance data, including repair and cleaning instructions.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who is an authorized representative of solid surface polymer product manufacturer for both installation and maintenance of work required for this project.

B. Allowable Tolerances: Variation in component size 1/8" +/-.

C. Comply with the Following Standards as referenced herein:

1. American National Standards Institute (ANSI).
2. American Society for Testing and Materials (ASTM).
3. National Electrical Manufacturers Association (NEMA).

D. Product shall meet the following requirements in accordance with the test procedures indicated:

1. Tensile Strength: 6000 psi/ASTM D 638.
2. Flexural Strength: 8000 psi/ASTM D 790.
3. Elongation: 0.4%/ASTM D 638.
4. Hardness: 94 Rockwell "M" Scale, ASTM D 785, 56 Barcol Impressor/ASTM D 2583
5. Thermal Expansion: 3.02 x 10^{-5} in/in/^{o}C; 1.80 x 10^{-5} in/in/^{o}F in accordance with ASTM D 696.
6. Gloss (60^{o} Gardner) 5-75 (matte-polished)/ANSI Z124.
7. Color Stability: No Change NEMA LD 3-3.10.
8. Wear and Cleanability: Passes ANSI Z 124.3 & Z 124.6.
9. Abrasion Resistance: No loss of pattern, Wt. loss (1,000 cycles) -0.2 gm Wear (10,000 cycles) -.008" per NEMA LD 3-3.10.
10. Impact Resistance:
    a. Notched Izod: .28 ft. lbs./in. of notch per ASTM D 256 (Method A).
    b. Gardner: Solid colors 9.3 ft. lbs. particulate colors 13.3 ft. lbs. per ASTM D 3029.
11. Stain Resistance: Passes ANSI Z 124.3.
12. Fungi and Bacteria: No attack per ASTM G21, G22.
13. Water Absorption: Per ASTM D 570.
    a. 3/4" sheet, 0.04% after 24 hrs., 0.94% long term.
    b. 1/4" sheet, 0.09% after 24 hrs., 0.8% long term.
14. Flammability: 0-25 Flame Spread, 0-30 Smoke Developed Rating, Class 1 Rating per ASTM E 84.
15. Coefficient of Friction: 0.189 static, 0.171 dynamic per DuPont Test TD-511-A.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver components to project site at time when areas are ready for installation. Store components indoors prior to installation.

B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage and/or staining following installation for duration of project.

1.6 WARRANTY

A. Provide manufacturer's 10 year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements of the specifications, provide solid surface polymer fabrications by:

1. Window Sills and architectural millwork: Corian Surfaces from the DuPont Company, or approved equal.

2.2 MATERIALS

A. Material: Homogeneous filled acrylic; not coated, laminated or of composite construction meeting ANSI Z 124.3 & .6, Type Six.

1. Material shall comply with the minimum physical properties listed under Quality Assurance article above.
2. Superficial damage to a depth of 0.010" shall be repaired by sanding and polishing.

B. Window Stools:

1. Surfaces shall be 1/2" thick solid surface polymer, with a 1" laminated nose overhanging the wall at stools edge, adhesively joined with inconspicuous seams and edge details in.
2. Window stool shall have a 1-1/2" jamb return (ears) at each jamb following the corner profile of the wall opening (right angle corner, bullnose, etc.) of the same laminated thickness and profile.
3. Attach to support structure with silicone sealant or other concealed fastening method recommended by the manufacturer as recommended by product manufacturer for the intended application.
4. Apron shall be the same width of the window frame and be four inches high, tight to the underside of the stool.
5. Apron sides and bottom shall have eased edges.
6. Color selected by Architect from manufacturer's full range of colors.

C. Countertops:

1. Front: Straight, slightly eased at top.
2. Backsplash: Straight, slightly eased at corner.
3. Endsplash: Matching backsplash.
4. Countertops: 3/4-inch-thick, solid surface material with front edge built up with same material.
5. Backsplashes: 1/2-inch-thick, solid surface material.

6. Fabrication: Fabricate tops in one piece with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

D. Joint Adhesive: Manufacturer’s standard two-part adhesive to create inconspicuous, non-porous joints, with a chemical bond.

E. Sealant: Mildew Resistant silicone, color matched to solid surface polymer, in accordance with Section 079200 “Joint Sealants”.

2.3 FABRICATION

A. Fabricator/Installer shall be a firm certified by product manufacturer.

B. Fabricate components in shop to greatest extent practical to sizes, shapes and profiles indicated, and in accordance with approved shop drawings and manufacturer’s written requirements.

C. Furnish tops in maximum practicable lengths, in configuration indicated on the drawings.

D. Form joints between components using manufacturer’s standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Attach 2” wide reinforcing strip of solid surface polymer under each joint in accordance with manufacturer’s written requirements. Coordinate required construction clearance for reinforcing strips.

E. Provide holes and cut-outs for accessories, existing conditions and work coordinated with other trades.

F. Rout and Finish Component Edges to a smooth, uniform finish. Rout all cut-outs and sand all edges smooth to an 1/8” edge. Repair or replace defective or inaccurate work.

G. Finish: All surfaces shall have uniform matte finish with a gloss rating of 5-20.

H. Splash and curbs shall be 4" high x thickness of the sheet material, unless otherwise noted on the drawings, and shall be located at the backs and sides of all counter tops, abutting an adjacent wall surface.

I. Provide no-drip edge at full perimeter of countertop.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install components plumb and level, in accordance with approved shop drawings and product installation details.

B. Form field joints using manufacturer’s recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.

C. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

D. Install countertops level to a tolerance of 1/8 inch in 8 feet.

E. Keep components and hands clean during installation. Remove adhesives, sealants and other stains.

F. Protect surfaces from damage until Date of Substantial Completion. Repair or replace damaged work that cannot be repaired to architect’s satisfaction.

G. Fabricator/Installer shall provide solid surface polymer manufacturer’s written care and maintenance instructions to the Owner and review care and maintenance procedures with Owner’s maintenance personnel upon project completion.

END OF SECTION 123661

SECTION 22 05 17- SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.
6. Silicone sealants.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. O-Z Gedney
2. CALPICO, Inc.
3. GPT; an EnPro Industries company.
4. Link Seal

B. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop collar.

C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized, with plain ends and integral welded waterstop collar.

D. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 STACK-SLEEVE FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Jay R. Smith Mfg. Co.
2. Zurn Industries, LLC.

B. Description: Manufactured, galvanized cast-iron sleeve with integral clamping flange for use in waterproof floors and roofs. Include clamping ring, bolts, and nuts for membrane flashing.
1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. O-Z Gedney
   2. CALPICO, Inc.
   3. Metraflex Company (The).
   4. Link Seal

B. Description:
   1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
   2. Designed to form a hydrostatic seal of 20 psig minimum.
   3. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, ASTM B 633 of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Advance Products & Systems, Inc.
   2. Metraflex Company (The).
   3. Proco Products, Inc.
   4. Link Seal
   5. O-Z Gedney

B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall.

C. Plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.6 SILICONE SEALANTS

A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant, ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Dow Corning Corporation.

    b. GE Construction Sealants; Momentive Performance Materials Inc.

    c. Polymeric Systems, Inc.

    d. Schnee-Morehead, Inc., an ITW company.

    e. Sherwin-Williams Company (The).
2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT. Grade P Pourable (self-leveling) formulation is for opening in floors and other horizontal surfaces that are not fire rated.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. May National Associates, Inc.; a subsidiary of Sika Corporation.
2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Silicone Foam: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Smooth-On.
2. Sealant shall have a VOC content of 250 g/L or less.
3. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
2. Using grout or silicone sealant, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.
1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 07 84 13 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.
1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 07 62 00 "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Use silicone sealant to seal the space around outside of stack-sleeve fittings.

B. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping specified in Section 07 84 13 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Use grout or silicone sealant to seal the space around outside of sleeve-seal fittings.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.

B. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:
   1. Exterior Concrete Walls above Grade:
      a. Piping Smaller Than NPS 6: Cast-iron pipe sleeves.
      b. Piping NPS 6 and Larger: Cast-iron pipe sleeves.
   2. Exterior Concrete Walls below Grade:
      a. Piping Smaller Than NPS 6: Cast-iron pipe sleeves with sleeve-seal system.
         1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
      b. Piping NPS 6] and Larger: Cast-iron pipe sleeves with sleeve-seal system.
         1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
   3. Concrete Slabs-on-Grade:
      a. Piping Smaller Than NPS 6: Cast-iron pipe sleeves with sleeve-seal system.
         1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
      b. Piping NPS 6 and Larger: Cast-iron pipe sleeves with sleeve-seal system.

END OF SECTION 220517

SECTION 22 05 18- ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Escutcheons.
   2. Floor plates.

1.2 DEFINITIONS

A. Existing Piping to Remain: Existing piping that is not to be removed and that is not otherwise indicated to be removed and salvaged, or removed and reinstalled.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. BrassCraft Manufacturing Co.; a Masco company.
   2. Dearborn Brass.
   3. Keeney Manufacturing Company (The).
   4. ProFlo; a Ferguson Enterprises, Inc. brand.

2.2 ESCUTCHEONS

A. One-Piece, Steel Type: With polished brass finish and setscrew fastener.

B. One-Piece, Stainless-Steel Type: With polished stainless-steel finish.

C. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

D. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.

2.3 FLOOR PLATES

A. Split Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.
   1. Escutcheons for New Piping:
      a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
      b. Chrome-Plated Piping: One-piece cast brass with polished, chrome-plated finish.
      c. Insulated Piping: One-piece cast brass with polished, chrome-plated finish.
      d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece cast brass with polished, chrome-plated finish.
      e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece cast brass with polished, chrome-plated finish.
      f. Bare Piping in Unfinished Service Spaces: One-piece cast brass with polished, chrome-plated finish.
      g. Bare Piping in Equipment Rooms: One-piece cast brass with polished, chrome-plated finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

3.2 FIELD QUALITY CONTROL

A. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION 220518

SECTION 22 05 19- METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Bimetallic-actuated thermometers.
2. Liquid-in-glass thermometers.
3. Thermowells.
4. Dial-type pressure gages.
5. Gage attachments.
6. Test plugs.
7. Test-plug kits.

B. Related Requirements:
1. Section 22 11 13 "Facility Water Distribution Piping" for domestic water meters and combined domestic and fire-protection water-service meters outside the building.
2. Section 22 11 19 "Domestic Water Piping Specialties" for water meters.
3. Section 22 15 13 "General-Service Compressed-Air Piping" for compressed air gages.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ashcroft Inc.
2. Marsh Bellofram.
3. Miljoco Corporation.
4. WATTS.

B. Standard: ASME B40.200.

C. Case: Liquid-filled and sealed type(s); stainless steel with 3-inch nominal diameter.

D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F.

E. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

F. Connector Size: 1/2 inch, with ASME B1.1 screw threads.

G. Stem: 0.25 or 0.375 inch in diameter; stainless steel.

H. Window: Plain glass or plastic.

I. Ring: Stainless steel.

J. Element: Bimetal coil.

K. Pointer: Dark-colored metal.

L. Accuracy: Plus or minus 1 percent of scale range.

2.2 FILLED-SYSTEM THERMOMETERS

A. Direct-Mounted, Metal-Case, Vapor-Actuated Thermometers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Ashcroft Inc.
   b. Marsh Bellofram.
   c. Palmer Wahl Instrumentation Group.
   d. Trerice, H. O. Co.
   e. Weiss Instruments, Inc.
2. Standard: ASME B40.200.
3. Case: Sealed type, cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
4. Element: Bourdon tube or other type of pressure element.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F and deg C.
7. Pointer: Dark-colored metal.
8. Window: Glass or plastic.
9. Ring: Metal.
10. Connector Type(s): Union joint, adjustable, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device rigid, back and rigid, bottom; with ASME B1.1 screw threads.
11. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.
    a. Design for Thermowell Installation: Bare stem.
12. Accuracy: Plus or minus 1 percent of scale range.

B. Direct-Mounted, Plastic-Case, Vapor-Actuated Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Ashcroft Inc.
   b. Miljoco Corporation.
   c. REOTEMP Instrument Corporation.
2. Standard: ASME B40.200.
3. Case: Sealed type, plastic; 4-1/2-inch nominal diameter.
4. Element: Bourdon tube or other type of pressure element.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F and deg C.
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Metal or plastic.
10. Connector Type(s): Union joint, adjustable, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device; with ASME B1.1 screw threads.
11. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.
    a. Design for Thermowell Installation: Bare stem.
12. Accuracy: Plus or minus 1 percent of scale range.

C. Remote-Mounted, Metal-Case, Vapor-Actuated Thermometers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Marsh Bellofram.
   b. Palmer Wahl Instrumentation Group.
   c. Trerice, H. O. Co.
   d. WIKA Instrument Corporation.
2. Standard: ASME B40.200.
3. Case: Sealed type, cast aluminum or drawn steel; 4-1/2-inch nominal diameter with back flange and holes for panel mounting.
4. Element: Bourdon tube or other type of pressure element.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Metal.
10. Connector Type(s): Union joint, bottom; with ASME B1.1 screw threads.
11. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.
    a. Design for Thermowell Installation: Bare stem.
12. Accuracy: Plus or minus 1 percent of scale range.

2.3 THERMOWELLS

A. Thermowells:
1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.

4. Type: Stepped shank unless straight or tapered shank is indicated.
5. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
6. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
7. Bore: Diameter required to match thermometer bulb or stem.
8. Insertion Length: Length required to match thermometer bulb or stem.
9. Lagging Extension: Include on thermowells for insulated piping and tubing.
10. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Ashcroft Inc.
   b. Flo Fab Inc.
   c. WATTS.
2. Standard: ASME B40.100.
3. Case: Sealed Solid-front, pressure relief type(s); cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Metal.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Flow Design, Inc.
2. Miljoco Corporation.
3. Trerice, H. O. Co.
4. WATTS.

B. Description: Test-station fitting made for insertion into piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending a minimum of 2 inches into fluid one-third of pipe diameter to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install remote-mounted pressure gages on panel.

I. Install valve and snubber in piping for each pressure gage for fluids.

J. Install test plugs in piping tees.

K. Install thermometers in the following locations:
1. Inlet and outlet of each water heater.
2. Inlets and outlets of each domestic water heat exchanger.
3. Inlet and outlet of each domestic hot-water storage tank.
4. Inlet and outlet of each remote domestic water chiller.

L. Install pressure gages in the following locations:
1. Building water service entrance into building.
2. Inlet and outlet of each pressure-reducing valve.
3. Suction and discharge of each domestic water pump.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each domestic water heater shall be one of the following:
   1. Sealed, bimetallic-actuated type.
   2. Direct-mounted, metal-case, vapor-actuated type.
   3. Metal case, industrial-style, liquid-in-glass type.
   4. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.

B. Thermometers at inlet and outlet of each domestic hot-water storage tank shall be[**one of**] the following:
   1. Sealed, bimetallic-actuated type.
   2. Direct-mounted, metal-case, vapor-actuated type.
   3. Metal case, compact-style, liquid-in-glass type.
   4. Direct-mounted, light-activated type.
   5. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.

C. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F.

B. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg F and 0 to 150 deg C.

3.6 PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each water service into building shall be one of the following:
   1. Sealed Solid-front, pressure-relief, direct-mounted, metal case.
   2. Sealed, direct-mounted, plastic case.

B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be one of the following:
   1. Sealed Open-front, pressure-relief, direct-mounted, metal case.
   2. Sealed, direct-mounted, plastic case.

C. Pressure gages at suction and discharge of each domestic water pump shall be one of the following:
   1. Sealed Solid-front, pressure-relief, direct-mounted, metal case.
   2. Sealed, direct-mounted, plastic case.

3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Water Service Piping: 0 to 160 psi and 0 to 1100 kPa.

END OF SECTION

SECTION 22 05 23.12- BALL VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Brass ball valves.
   2. Bronze ball valves.
   3. Steel ball valves.
   4. Iron ball valves.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of valve.
   1. Certification that products comply with NSF 61 Annex G.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, and soldered ends.
   3. Set ball valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
   1. ASME B1.20.1 for threads for threaded end valves.
   2. ASME B16.1 for flanges on iron valves.
   3. ASME B16.5 for flanges on steel valves.
   4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
   5. ASME B16.18 for solder-joint connections.
   6. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 Annex G for valve materials for potable-water service.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:
   1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
   2. Handlever: For quarter-turn valves smaller than NPS 4.

H. Valves in Insulated Piping:
   1. Include 2-inch stem extensions.
   2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
   3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRASS BALL VALVES

A. Brass Ball Valves, One-Piece:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Apollo Valves; Conbraco Industries, Inc.
      b. NIBCO
      c. Brasscraft
   2. Description:
      a. Standard: MSS SP-110.
      b. CWP Rating: 400 psig.
      c. Body Design: One piece.
      d. Body Material: Forged brass or bronze.
      e. Ends: Threaded and soldered.
      f. Seats: PTFE.
      g. Stem: Brass or stainless steel.
      h. Ball: Chrome-plated brass or stainless steel.
      i. Port: Reduced.

B. Brass Ball Valves, Two-Piece with Full Port and Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Apollo Valves; Conbraco Industries, Inc.
   b. Brasscraft
   c. Milwaukee Valve Company.
   d. NIBCO INC.
2. Description:
   a. Standard: MSS SP-110.
   b. CWP Rating: 600 psig.
   c. Body Design: Two piece.
   d. Body Material: Forged brass.
   e. Ends: Threaded and soldered.
   f. Seats: PTFE.
   g. Stem: Brass.
   h. Ball: Chrome-plated brass.
   i. Port: Full.

C. Brass Ball Valves, Two-Piece with Regular Port and Brass Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Apollo Valves; Conbraco Industries, Inc.
   b. NIBCO INC.
   c. WATTS.
   d. Brasscraft
2. Description:
   a. Standard: MSS SP-110.
   b. CWP Rating: 600 psig.
   c. Body Design: Two piece.
   d. Body Material: Forged brass.
   e. Ends: Threaded and soldered.
   f. Seats: PTFE.
   g. Stem: Brass.
   h. Ball: Chrome-plated brass.
   i. Port: Regular.

D. Brass Ball Valves, Three-Piece with Full Port and Brass Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Apollo Valves; Combraco Industries, Inc.
   b. NIBCO
   c. Brasscraft
   d. WATTS.
2. Description:
   a. Standard: MSS SP-110.
   b. CWP Rating: 600 psig.
   c. Body Design: Three piece.
   d. Body Material: Forged brass.
   e. Ends: Threaded and soldered.
   f. Seats: PTFE.
   g. Stem: Brass.

h. Ball: Chrome-plated brass.
i. Port: Full.

2.3 BRONZE BALL VALVES

A. Bronze Ball Valves, One-Piece with Bronze Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Apollo Valves; Conbraco Industries, Inc.
b. NIBCO INC.
c. WATTS.
d. Brasscraft
2. Description:
a. Standard: MSS SP-110.
b. CWP Rating: 400 psig.
c. Body Design: One piece.
d. Body Material: Bronze.
e. Ends: Threaded.
f. Seats: PTFE.
g. Stem: Bronze.
h. Ball: Chrome-plated brass.
i. Port: Reduced.

B. Bronze Ball Valves, One-Piece with Stainless-Steel Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Apollo Valves; Conbraco Industries, Inc.
b. NIBCO INC.
c. WATTS.
d. Brasscraft
2. Description:
a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: One piece.
d. Body Material: Bronze.
e. Ends: Threaded.
f. Seats: PTFE.
g. Stem: Stainless steel.
h. Ball: Stainless steel, vented.
i. Port: Reduced.

C. Bronze Ball Valves, Two-Piece with Full Port, and Bronze or Brass Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Milwaukee Valve Company.
b. NIBCO INC.
c. WATTS.
d. Zurn Industries, LLC.
e. Brasscraft

2. Description:
    a. Standard: MSS SP-110.
    b. CWP Rating: 600 psig.
    c. Body Design: Two piece.
    d. Body Material: Bronze.
    e. Ends: Threaded and soldered.
    f. Seats: PTFE.
    g. Stem: Bronze or brass.
    h. Ball: Chrome-plated brass.
    i. Port: Full.

D. Bronze Ball Valves, Two-Piece with Full Port and Stainless-Steel Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Apollo Valves; Conbraco Industries, Inc.
    b. Milwaukee Valve Company.
    c. NIBCO INC.
    d. WATTS.
    e. Brasscraft
2. Description:
    a. Standard: MSS SP-110.
    b. CWP Rating: 600 psig.
    c. Body Design: Two piece.
    d. Body Material: Bronze.
    e. Ends: Threaded or soldered.
    f. Seats: PTFE.
    g. Stem: Stainless steel.
    h. Ball: Stainless steel, vented.
    i. Port: Full.

E. Bronze Ball Valves, Two-Piece with Regular Port and Bronze or Brass Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Apollo Valves; Conbraco Industries, Inc.
    b. Milwaukee Valve Company.
    c. NIBCO INC.
    d. WATTS.
    e. Brasscraft
2. Description:
    a. Standard: MSS SP-110.
    b. CWP Rating: 600 psig.
    c. Body Design: Two piece.
    d. Body Material: Bronze.
    e. Ends: Threaded.
    f. Seats: PTFE.
    g. Stem: Bronze or brass.
    h. Ball: Chrome-plated brass.
    i. Port: Regular.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install valve tags. Comply with requirements in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

B. Select valves with the following end connections:
   1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option 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.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:
1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Brass ball valve, one piece.
3. Bronze ball valve, one piece with bronze trim.
4. Brass ball valves, two-piece with full port and brass trim.
5. Bronze ball valves, two-piece with full port and bronze or brass trim.
6. Brass ball valves, three-piece with full port and brass trim.
7. Bronze ball valves, three-piece with full port and bronze or brass trim.
8. Bronze ball valves, two-piece with regular port and bronze trim.

B. Pipe NPS 2-1/2 and Larger:
1. Steel and Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Steel ball valves, Class 150 with full port.
3. Iron ball valves, Class 150.

END OF SECTION 220523.12

SECTION 22 05 23.13- BUTTERFLY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Iron, single-flange butterfly valves.
   2. Iron, grooved-end butterfly valves.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene-diene terpolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of valve.
   1. Certification that products comply with NSF 61 Annex G.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, grooves, and weld ends.
   3. Set butterfly valves closed or slightly open.

B. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
1. ASME B16.1 for flanges on iron valves.
2. ASME B16.5 for flanges on steel valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B31.9 for building service piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. NSF Compliance: NSF 61 Annex G for valve materials for potable-water service.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:
1. Gear Actuator: For valves NPS 8 and larger.
2. Handlever: For valves NPS 6 and smaller.

H. Valves in Insulated Piping: With 2-inch stem extensions.

2.2 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. Iron, Single-Flange Butterfly Valves with Aluminum-Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Apollo Valves; Conbraco Industries, Inc.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. NIBCO INC.
e.
2. Description:
a. Standard: MSS SP-67, Type I.
b. CWP Rating: [250 psig].
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: [EPDM]
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

B. Iron, Single-Flange Butterfly Valves with Ductile-Iron Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Apollo Valves; Conbraco Industries, Inc.
   b. Hammond Valve.
   c. Milwaukee Valve Company.
   d. Mueller Steam Specialty; A WATTS Brand.
   e. NIBCO INC.
2. Description:
   a. Standard: MSS SP-67, Type I.
   b. CWP Rating: 200 psig.
   c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
   d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
   e. Seat: EPDM.
   f. Stem: One- or two-piece stainless steel.
   g. Disc: Nickel-plated ductile iron.

C. Iron, Single-Flange Butterfly Valves with Stainless-Steel Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Apollo Valves; Conbraco Industries, Inc.
   b. Milwaukee Valve Company.
   c. NIBCO INC.
2. Description:
   a. Standard: MSS SP-67, Type I.
   b. CWP Rating, NPS 12 and Smaller: 200 psig.
   c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
   d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
   e. Seat: EPDM.
   f. Stem: One- or two-piece stainless steel.
   g. Disc: Stainless steel.

2.3 DUCTILE-IRON, GROOVED-END BUTTERFLY VALVES

A. Ductile Iron, Grooved-End Butterfly Valves, 175 CWP:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Kennedy Valve Company; a division of McWane, Inc.
   b. Shurjoint Piping Products USA Inc.
   c. Tyco Fire Products LP.
   d. Victaulic Company.
   e. Zurn Industries, LLC.
2. Description:
   a. Standard: MSS SP-67, Type I.
   b. CWP Rating: 175 psig.
   c. Body Material: Coated, ductile iron.
   d. Stem: Two-piece stainless steel.
   e. Disc: Coated, ductile iron.

f. Seal: EPDM.

B. Ductile Iron, Grooved-End Butterfly Valves, 300 CWP:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Mueller Steam Specialty; A WATTS Brand.
b. NIBCO INC.
c. Tyco Fire Products LP.
d. Victaulic Company.
2. Description:
a. Standard: MSS SP-67, Type I.
b. CWP Rating, NPS 8 and Smaller: 300 psig.
c. CWP Rating, NPS 10 and Larger: 200 psig.
d. Body Material: Coated, ductile iron.
e. Stem: Two-piece stainless steel.
f. Disc: Coated, ductile iron.
g. Seal: EPDM.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine mating flange faces for damage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

D. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install valve tags. Comply with requirements in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, ductile-iron disc.

B. Ductile-Iron, Grooved-End Butterfly Valves: 175 CWP.

END OF SECTION 220523.13

SECTION 22 05 23.14- CHECK VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Bronze lift check valves.
2. Bronze swing check valves.
3. Iron swing check valves.
4. Iron swing check valves with closure control.
5. Iron, grooved-end swing check valves.
6. Iron, center-guided check valves.
7. Iron, plate-type check valves.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene-diene terpolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of valve.
1. Certification that products comply with NSF 61 Annex G.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set check valves in either closed or open position.

B. Use the following precautions during storage:
1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder joint.
5. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. NSF Compliance: NSF 61 Annex G for valve materials for potable-water service.

E. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

F. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

G. Valve Sizes: Same as upstream piping unless otherwise indicated.

H. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE LIFT CHECK VALVES

A. Bronze Lift Check Valves with Bronze Disc, Class 125:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Crane; Crane Energy Flow Solutions.
b. Jenkins Valves; Crane Energy Flow Solutions.
c. Stockham; Crane Energy Flow Solutions.
2. Description:
a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig.
c. Body Design: Vertical flow.
d. Body Material: ASTM B 61 or ASTM B 62, bronze.
e. Ends: Threaded or soldered. See valve schedule articles.
f. Disc: Bronze.

B. Bronze Lift Check Valves with Nonmetallic Disc, Class 125:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Hammond Valve.
b. Milwaukee Valve Company.

c. NIBCO INC.
d. WATTS.

2. Description:
a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig.
c. Body Design: Vertical flow.
d. Body Material: ASTM B 61 or ASTM B 62, bronze.
e. Ends: Threaded or soldered. See valve schedule articles.
f. Disc: NBR, PTFE.

2.3 BRONZE SWING CHECK VALVES

A. Bronze Swing Check Valves with Bronze Disc, Class 125:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Apollo Valves; Conbraco Industries, Inc.
b. Crane; Crane Energy Flow Solutions.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. WATTS.
2. Description:
a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded or soldered. See valve schedule articles.
f. Disc: Bronze.

B. Bronze Swing Check Valves with Nonmetallic Disc, Class 125:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Apollo Valves; Conbraco Industries, Inc.
b. Milwaukee Valve Company.
c. NIBCO INC.
d. WATTS.
2. Description:
a. Standard: MSS SP-80, Type 4.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded or soldered. See valve schedule articles.
f. Disc: PTFE.

C. Bronze Swing Check Valves with Bronze Disc, Class 150:
1. Manufacturers: Subject to compliance with requirements, provide products by the following
a. Apollo Valves; Conbraco Industries, Inc.
b. Crane; Crane Energy Flow Solutions.
c. Macomb Groups (The).
d. NIBCO INC.

2. Description:
   a. Standard: MSS SP-80, Type 3.
   b. CWP Rating: 300 psig.
   c. Body Design: Horizontal flow.
   d. Body Material: ASTM B 62, bronze.
   e. Ends: Threaded or soldered. See valve schedule articles.
   f. Disc: Bronze.

D. Bronze Swing Check Valves with Nonmetallic Disc, Class 150:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Hammond Valve.
   b. Milwaukee Valve Company.
   c. NIBCO INC.
   d. WATTS.
2. Description:
   a. Standard: MSS SP-80, Type 4.
   b. CWP Rating: 300 psig.
   c. Body Design: Horizontal flow.
   d. Body Material: ASTM B 62, bronze.
   e. Ends: Threaded or soldered. See valve schedule articles.
   f. Disc: PTFE.

2.4 IRON SWING CHECK VALVES

A. Iron Swing Check Valves with Metal Seats, Class 125:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Apollo Valves; Conbraco Industries, Inc.
   b. Jenkins Valves; Crane Energy Flow Solutions.
   c. NIBCO INC.
   d. Stockham; Crane Energy Flow Solutions.
2. Description:
   a. Standard: MSS SP-71, Type I.
   b. CWP Rating: 200 psig.
   c. Body Design: Clear or full waterway.
   d. Body Material: ASTM A 126, gray iron with bolted bonnet.
   e. Ends: Flanged or threaded. See valve schedule articles.
   f. Trim: Bronze.
   g. Gasket: Asbestos free.

B. Iron Swing Check Valves with Nonmetallic-to-Metal Seats, Class 125:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane; Crane Energy Flow Solutions.
   b. Stockham; Crane Energy Flow Solutions.
2. Description:
   a. Standard: MSS SP-71, Type I.
   b. CWP Rating: 200 psig.

c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged or threaded. See valve schedule articles.
f. Trim: Composition.
g. Seat Ring: Bronze.
h. Disc Holder: Bronze.
i. Disc: PTFE.
j. Gasket: Asbestos free.

C. Iron Swing Check Valves with Metal Seats, Class 250:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Apollo Valves; Conbraco Industries, Inc.
b. Milwaukee Valve Company.
c. NIBCO INC.
d. WATTS.
2. Description:
a. Standard: MSS SP-71, Type I.
b. CWP Rating: 500 psig.
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged or threaded. See valve schedule articles.
f. Trim: Bronze.
g. Gasket: Asbestos free.

2.5 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

A. Iron Swing Check Valves with Lever- and Spring-Closure Control, Class 125:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Hammond Valve.
b. Jenkins Valves; Crane Energy Flow Solutions.
c. NIBCO INC.
d. WATTS.
2. Description:
a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged or threaded. See valve schedule articles.
f. Trim: Bronze.
g. Gasket: Asbestos free.
h. Closure Control: Factory-installed exterior lever and weight.

B. Iron Swing Check Valves with Lever and Weight-Closure Control, Class 125:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Apollo Valves; Conbraco Industries, Inc.
b. Hammond Valve.

c. NIBCO INC.
d. WATTS.

2. Description:
a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged or threaded. See valve schedule articles.
f. Trim: Bronze.
g. Gasket: Asbestos free.
h. Closure Control: Factory-installed exterior lever and weight.

2.6 IRON, GROOVED-END SWING CHECK VALVES

A. Iron, Grooved-End Swing Check Valves, 300 CWP:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Anvil International.
b. Shurjoint Piping Products USA Inc.
c. Tyco Fire Products LP.
d. Victaulic Company.
2. Description:
a. CWP Rating: 300 psig.
b. Body Material: ASTM A 536, ductile iron.
c. Seal: EPDM.
d. Disc: Spring operated, ductile iron or stainless steel.

2.7 IRON, CENTER-GUIDED, SPRING-LOADED CHECK VALVES

A. Iron, Compact-Wafer, Center-Guided Check Valves with Metal Seat, Class 125:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Anvil International.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. NIBCO INC.
2. Description:
a. Standard: MSS SP-125.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 126, gray iron.
d. Style: Compact wafer, spring loaded.
e. Seat: Bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:
   1. Swing Check Valves: In horizontal position with hinge pin level.
   2. Lift Check Valves: With stem upright and plumb.

F. Install valve tags. Comply with requirements in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:
   1. Pump-Discharge Check Valves:
      a. NPS 2 and Smaller: Bronze swing check valves with bronze or nonmetallic disc.

B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

C. End Connections:
1. For Copper Tubing, NPS 2 and Smaller: Threaded or soldered.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged or threaded.
3. For Copper Tubing, NPS 5 and Larger: Flanged.
4. For Steel Piping, NPS 2 and Smaller: Threaded.
5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged or threaded.
6. For Steel Piping, NPS 5 and Larger: Flanged.
7. For Grooved-End Copper Tubing: Grooved.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller: Bronze swing check valves with bronze disc, Class 125, with soldered or threaded end connections.

B. Pipe NPS 2-1/2 and Larger:
1. Iron swing check valves with metal seats, Class 125, with threaded or flanged end connections.
2. Iron swing check valves with closure control lever and spring, Class 125, with threaded or flanged end connections.
3. Iron, grooved-end swing check valves, 300 CWP.
4. Iron, center-guided check valves with compact wafer, Class 125.
5. Iron, center-guided check valves with globe, seat, Class 125, with end connections.
6. Iron, dual-plate check valves with metal seat, Class 125, with threaded or flanged end connections.
7. Iron, single-plate check valves with resilient seat, Class 125, with threaded or flanged end connections.

END OF SECTION 220523.14

SECTION 22 05 23.15- GATE VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Bronze gate valves.
   2. Iron gate valves.
   3. Chainwheels.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

B. NRS: Nonrising stem.

C. OS&Y: Outside screw and yoke.

D. RS: Rising stem.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of valve.
   1. Certification that products comply with NSF 61 Annex G.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, grooves, and weld ends.
   3. Set gate valves closed to prevent rattling.

B. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder joint.
5. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 Annex G for valve materials for potable-water service.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. RS Valves in Insulated Piping: With 2-inch stem extensions.

H. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE GATE VALVES

A. Bronze Gate Valves, NRS, Class 125:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Apollo Valves; Conbraco Industries, Inc.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. NIBCO INC.
2. Description:
a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig.
c. Body Material: Bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

B. Bronze Gate Valves, RS, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Apollo Valves; Conbraco Industries, Inc.
   b. Milwaukee Valve Company.
   c. NIBCO INC.
   d. WATTS.
2. Description:
   a. Standard: MSS SP-80, Type 2.
   b. CWP Rating: 200 psig.
   c. Body Material: Bronze with integral seat and screw-in bonnet.
   d. Ends: Threaded or solder joint.
   e. Stem: Bronze.
   f. Disc: Solid wedge; bronze.
   g. Packing: Asbestos free.
   h. Handwheel: Malleable iron, bronze, or aluminum.

C. Bronze Gate Valves, NRS, Class 150:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Apollo Valves; Conbraco Industries, Inc.
   b. Milwaukee Valve Company.
   c. NIBCO INC.
   d. Powell Valves.
   e. WATTS.
2. Description:
   a. Standard: MSS SP-80, Type 1.
   b. CWP Rating: 300 psig.
   c. Body Material: Bronze with integral seat and union-ring bonnet.
   d. Ends: Threaded.
   e. Stem: Bronze.
   f. Disc: Solid wedge; bronze.
   g. Packing: Asbestos free.
   h. Handwheel: Malleable iron, bronze, or aluminum.

D. Bronze Gate Valves, RS, Class 150:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Apollo Valves; Conbraco Industries, Inc.
   b. Milwaukee Valve Company.
   c. NIBCO INC.
   d. Powell Valves.
   e. WATTS.
2. Description:
   a. Standard: MSS SP-80, Type 2.
   b. CWP Rating: 300 psig.
   c. Body Material: Bronze with integral seat and union-ring bonnet.
   d. Ends: Threaded.
   e. Stem: Bronze.
   f. Disc: Solid wedge; bronze.
   g. Packing: Asbestos free.

h. Handwheel: Malleable iron, bronze, or aluminum.

2.3 IRON GATE VALVES

A. Iron Gate Valves, NRS, Class 150:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Apollo Valves; Conbraco Industries, Inc.
   b. Milwaukee Valve Company.
   c. NIBCO INC.
   d. Powell Valves.
   e. WATTS.
2. Description:
   a. Standard: MSS SP-70, Type I.
   b. CWP Rating: 200 psig.
   c. Body Material: Gray iron with bolted bonnet.
   d. Ends: Flanged.
   e. Trim: Bronze.
   f. Disc: Solid wedge.
   g. Packing and Gasket: Asbestos free.

B. Iron Gate Valves, OS&Y, Class 125:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Apollo Valves; Conbraco Industries, Inc.
   b. NIBCO INC.
   c. Powell Valves.
   d. WATTS.
2. Description:
   a. Standard: MSS SP-70, Type I.
   b. CWP Rating: 200 psig.
   c. Body Material: Gray iron with bolted bonnet.
   d. Ends: Flanged.
   e. Trim: Bronze.
   f. Disc: Solid wedge.
   g. Packing and Gasket: Asbestos free.

C. Iron Gate Valves, NRS, Class 250:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Apollo Valves; Conbraco Industries, Inc.
   b. Crane; Crane Energy Flow Solutions.
   c. NIBCO INC.
   d. Stockham; Crane Energy Flow Solutions.
2. Description:
   a. Standard: MSS SP-70, Type I.
   b. CWP Rating: 500 psig.
   c. Body Material: Gray iron with bolted bonnet.
   d. Ends: Flanged.

e. Trim: Bronze.
f. Disc: Solid wedge.
g. Packing and Gasket: Asbestos free.

D. Iron Gate Valves, OS&Y, Class 250:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Apollo Valves; Conbraco Industries, Inc.
b. Hammond Valve.
c. NIBCO INC.
d. WATTS.
2. Description:
a. Standard: MSS SP-70, Type I.
b. CWP Rating: 500 psig.
c. Body Material: Gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Disc: Solid wedge.
g. Packing and Gasket: Asbestos free.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install valve tags. Comply with requirements in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. Use gate valves for shutoff service only.

B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

C. For Grooved-End Copper Tubing: Valve ends may be grooved.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller: Bronze gate valves, NRS, with soldered ends.

B. Pipe NPS 2-1/2 and Larger: Iron gate valves, OS&Y, Class 125 with flanged ends.

END OF SECTION 220523.15

SECTION 22 05 48.13- VIBRATION CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Open-spring isolators.
5. Housed-spring isolators.
6. Restrained-spring isolators.
7. Housed-restrained-spring isolators.
8. Pipe-riser resilient supports.
9. Resilient pipe guides.
10. Elastomeric hangers.
11. Spring hangers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device type required.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Air-Mounting System Performance Certification: Include natural frequency, load, and damping test data.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Ace Mountings Co., Inc.
   b. Mason Industries, Inc.
   c. Vibration Eliminator Co., Inc.
   d. Vibration Isolation.
2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
3. Size: Factory or field cut to match requirements of supported equipment.
4. Infused nonwoven cotton or synthetic fibers.
5. Load-bearing metal plates adhered to pads.
6. Sandwich-Core Material: Resilient and elastomeric.
   a. Surface Pattern: Smooth pattern.
   b. Infused nonwoven cotton or synthetic fibers.

2.2 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Ace Mountings Co., Inc.
   b. Mason Industries, Inc.
   c. Vibration Eliminator Co., Inc.
   d. Vibration Isolation.
2. Mounting Plates:
   a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
   b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.
3. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.3 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. California Dynamics Corporation.
   b. Mason Industries, Inc.
   c. Vibration Eliminator Co., Inc.
   d. Vibration Isolation.

2. Description: All-directional isolator with restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
   a. Housing: Cast-ductile iron or welded steel.
   b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.4 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators: .
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. California Dynamics Corporation.
      b. Mason Industries, Inc.
      c. Vibration Eliminator Co., Inc.
      d. Vibration Isolation.
   2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
   6. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig.
   7. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.5 HOUSED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing: .
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. California Dynamics Corporation.
      b. Kinetics Noise Control, Inc.
      c. Mason Industries, Inc.
      d. Vibration Isolation.
   2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
   6. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.
      a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
      b. Top housing with attachment and leveling bolt.

2.6 RESTRAINED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint: .
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. California Dynamics Corporation.
      b. Mason Industries, Inc.
      c. Vibration Eliminator Co., Inc.
      d. Vibration Isolation.
   2. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.
      a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
      b. Top plate with threaded mounting holes.
      c. Internal leveling bolt that acts as blocking during installation.
   3. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
   4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.7 HOUSED-RESTRAINED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint: .
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. California Dynamics Corporation.
      b. Kinetics Noise Control, Inc.
      c. Mason Industries, Inc.
      d. Vibration Isolation.
   2. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with adjustable snubbers to limit vertical movement.
      a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
      b. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.
   3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.8 PIPE-RISER RESILIENT SUPPORT

A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch-thick neoprene.
   1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
   2. Maximum Load Per Support: 500 psigon isolation material providing equal isolation in all directions.

2.9 RESILIENT PIPE GUIDES

A. Description: Telescopic arrangement of two steel tubes or post and sleeve arrangement separated by a minimum 1/2-inch-thick neoprene Insert drawing designation.
   1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.10 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods: .
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. California Dynamics Corporation.
      b. Kinetics Noise Control, Inc.
      c. Mason Industries, Inc.
      d. Vibration Eliminator Co., Inc.
   2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
   3. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.11 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression: .
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. California Dynamics Corporation.
      b. Mason Industries, Inc.
      c. Vibration Isolation.
      d. Vibration Mountings & Controls, Inc.
   2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
   3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   4. Minimum Additional Travel: 50 percent of the required deflection at rated load.

5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
8. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
9. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 VIBRATION CONTROL DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 03 30 00 "Cast-in-Place Concrete."

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

END OF SECTION 220548.13

SECTION 22 07 19- PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following plumbing piping services:
   1. Domestic cold-water piping.
   2. Domestic hot-water piping.
   3. Domestic recirculating hot-water piping.
   4. Sanitary waste piping exposed to freezing conditions.
   5. Storm-water piping exposed to freezing conditions.
   6. Horizontal Storm piping
   7. Roof drains and rainwater leaders.
   8. Supplies and drains for handicap-accessible lavatories and sinks.

1.2 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.3 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. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Comply with the following applicable standards and other requirements specified for miscellaneous components:
   1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.4 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 sizes and locations of supports, hangers, and insulation shields specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

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

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Johns Manville; a Berkshire Hathaway company.
      b. Knauf Insulation.
      c. Manson Insulation Inc.
      d. Owens Corning.

G. Mineral-Fiber, Preformed Pipe Insulation:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Johns Manville; a Berkshire Hathaway company.

b. Knauf Insulation.

c. Manson Insulation Inc.

d. Owens Corning.

2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "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. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.

b. Eagle Bridges - Marathon Industries.

c. Foster Brand; H. B. Fuller Construction Products.

d. Mon-Eco Industries, Inc.

C. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Dow Corning Corporation.

b. Johns Manville; a Berkshire Hathaway company.

2.3 MASTICS

A. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.

b. Foster Brand; H. B. Fuller Construction Products.

c. Knauf Insulation.

d. Vimasco Corporation.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

B. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Childers Brand; H. B. Fuller Construction Products.

    b. Eagle Bridges - Marathon Industries.

    c. Foster Brand; H. B. Fuller Construction Products.

    d. Mon-Eco Industries, Inc.
2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
3. Service Temperature Range: 0 to 180 deg F.
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Childers Brand; H. B. Fuller Construction Products.

    b. Eagle Bridges - Marathon Industries.

    c. Foster Brand; H. B. Fuller Construction Products.
2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

D. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Childers Brand; H. B. Fuller Construction Products.

    b. Eagle Bridges - Marathon Industries.

    c. Knauf Insulation.

    d. Vimasco Corporation.
2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.4 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Childers Brand; H. B. Fuller Construction Products.
      b. Foster Brand; H. B. Fuller Construction Products.
      c. Vimasco Corporation.
   2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
   3. Service Temperature Range: 0 to plus 180 deg F.
   4. Color: White.

2.5 SEALANTS

A. Joint Sealants for Cellular-Glass and Phenolic Products:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Childers Brand; H. B. Fuller Construction Products.
      b. Eagle Bridges - Marathon Industries.
      c. Mon-Eco Industries, Inc.
      d. Pittsburgh Corning Corporation.
   2. Materials shall be compatible with insulation materials, jackets, and substrates.
   3. Permanently flexible, elastomeric sealant.
   4. Service Temperature Range: Minus 100 to plus 300 deg F.
   5. Color: White or gray.

B. FSK and Metal Jacket Flashing Sealants:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Childers Brand; H. B. Fuller Construction Products.
      b. Eagle Bridges - Marathon Industries.
      c. Foster Brand; H. B. Fuller Construction Products.
      d. Mon-Eco Industries, Inc.
   2. Materials shall be compatible with insulation materials, jackets, and substrates.
   3. Fire- and water-resistant, flexible, elastomeric sealant.
   4. Service Temperature Range: Minus 40 to plus 250 deg F.
   5. Color: Aluminum.

6. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.6 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.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Johns Manville; a Berkshire Hathaway company.
      b. Proto Corporation.
      c. Speedline Corporation.
   2. Adhesive: As recommended by jacket material manufacturer.
   3. Color: White.
   4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
      a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Underground Direct-Buried Jacket: 125-mil-thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Pittsburgh Corning Corporation.
      b. Polyguard Products, Inc.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Avery Dennison Corporation, Specialty Tapes Division.
      b. Compac Corporation.
      c. Knauf Insulation.
      d. Venture Tape.
   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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Compac Corporation.
      b. Ideal Tape Co., Inc., an American Biltrite Company.
      c. Venture Tape.
   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.

2.9 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Buckaroos, Inc.
      b. McGuire Manufacturing.
      c. Truebro.
      d. Zurn Industries, LLC.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures,:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Truebro.

b. Zurn Industries, LLC.
2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

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

L. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
   3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at [4 inches] o.c.

      a. For below-ambient services, apply vapor-barrier mastic over staples.
   4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.

5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 84 13 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
   1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
   2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
   3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
   4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
   5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
   1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
   2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
   3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
   4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
   1. Install preformed pipe insulation to outer diameter of pipe flange.
   2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
   4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:
1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.8 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."

B. Do not field paint aluminum or stainless-steel jackets.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

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.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:
1. NPS 1 and Smaller: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.

b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
2. NPS 1-1/4 and Larger: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.

b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Domestic Hot and Recirculated Hot Water:
1. NPS 1-1/4 and Smaller: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.

b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
2. NPS 1-1/2 and Larger: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.

b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

C. Stormwater and Overflow:
1. All Pipe Sizes: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.

b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

D. Roof Drain and Overflow Drain Bodies:

1. All Pipe Sizes: Insulation shall be one of the following:

    a. Cellular Glass: 1-1/2 inches thick.

    b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

E. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F:
1. All Pipe Sizes: Insulation shall be one of the following:

    a. Cellular Glass: 1-1/2 inches thick.

    b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch Insert dimension thick.

3.12 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 220719

SECTION 22 11 13 - FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes water-distribution piping and related components outside the building for water service and fire-service mains.

B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
   2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
   3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.

D. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

E. NSF Compliance:

1. Comply with NSF 61 Annex G for materials for water-service piping and specialties for domestic water.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
   1. Notify Architect & Construction Manager no fewer than two days in advance of proposed interruption of service.
   2. Do not proceed with interruption of water-distribution service without Architect's and Construction Manager's written permission.

1.7 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Type K, water tube, annealed temper.
   1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

B. Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.
   1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

C. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
   1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
   2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

D. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
   1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
   2. Gaskets: AWWA C111, rubber.

E. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.
   1. Grooved-End, Ductile-Iron Pipe Appurtenances:

2.2 JOINING MATERIALS

A. Refer to Section 33 05 00 "Common Work Results for Utilities" for commonly used joining materials.

B. Brazing Filler Metals: AWS A5.8, BCuP Series.

2.3 PIPING SPECIALTIES

A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

B. Tubular-Sleeve Pipe Couplings:
1. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.
    a. Standard: AWWA C219.

2.4 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. American Cast Iron Pipe Company.
    b. Mueller Co.
    c. NIBCO INC.
    d. Tyler Pipe; a subsidiary of McWane Inc.
2. Nonrising-Stem, Metal-Seated Gate Valves:
    a. Description: Gray- or ductile-iron body and bonnet; with cast-iron or bronze double-disc gate, bronze gate rings, bronze stem, and stem nut.
        1) Standard: AWWA C500.
        2) Minimum Pressure Rating: 200 psig.
        3) End Connections: Mechanical joint.
        4) Interior Coating: Complying with AWWA C550.
3. Nonrising-Stem, Resilient-Seated Gate Valves:
    a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
        1) Standard: AWWA C509.
        2) Minimum Pressure Rating: 200 psig.
        3) End Connections: Mechanical joint.
        4) Interior Coating: Complying with AWWA C550.
4. Nonrising-Stem, High-Pressure, Resilient-Seated Gate Valves:
    a. Description: Ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze stem, and stem nut.
        1) Standard: AWWA C509.
        2) Minimum Pressure Rating: 250 psig.
        3) End Connections: Push on or mechanical joint.
        4) Interior Coating: Complying with AWWA C550.
5. OS&Y, Rising-Stem, Metal-Seated Gate Valves:

a. Description: Cast- or ductile-iron body and bonnet, with cast-iron double disc, bronze disc and seat rings, and bronze stem.
   1) Standard: AWWA C500.
   2) Minimum Pressure Rating: 200 psig.
   3) End Connections: Flanged.

6. OS&Y, Rising-Stem, Resilient-Seated Gate Valves:
   a. Description: Cast- or ductile-iron body and bonnet, with bronze or gray- or ductile-iron gate, resilient seats, and bronze stem.
      1) Standard: AWWA C509.
      2) Minimum Pressure Rating: 200 psig.
      3) End Connections: Flanged.

B. Bronze Gate Valves:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. Hammond Valve.
   b. Milwaukee Valve Company.
   c. NIBCO INC.
   d. Stockham; Crane Energy Flow Solutions.
2. OS&Y, Rising-Stem Gate Valves:
   a. Description: Bronze body and bonnet and bronze stem.
      1) Standards: UL 262 and FMG approved.
      2) Minimum Pressure Rating: 175 psig.
      3) End Connections: Threaded.
3. Nonrising-Stem Gate Valves:
   a. Description: Class 125, Type 1, bronze with solid wedge, threaded ends, and malleable-iron handwheel.
      1) Standard: MSS SP-80.

2.5 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. American Cast Iron Pipe Company.
   b. Clow Valve Company; a subsidiary of McWane, Inc.
   c. Kennedy Valve Company; a division of McWane, Inc.
   d. Mueller Co.
2. Description: Sleeve and valve compatible with drilling machine.
   a. Standard: MSS SP-60.
   b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
   c. Valve: AWWA, cast-iron, nonrising-stem, resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.

2.6 WATER METERS

A. Water meters will be furnished by utility company.

2.7 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Ames Fire & Waterworks.
   b. Apollo Valves; Conbraco Industries, Inc.
   c. Watts; a Watts Water Technologies company.
   d. Wilkins.
2. Standard: ASSE 1013 or AWWA C511.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
5. Size:
6. Design Flow Rate:
7. Selected Unit Flow Range Limits:
8. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
9. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
10. Configuration: Designed for horizontal, straight through flow.
11. Accessories:
   a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; OS&Y gate type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
   b. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Section 31 20 00 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground water-service piping NPS 3/4 to NPS 3 shall be soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

F. Underground water-service piping NPS 4 and NPS 6 shall be:
   1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.

G. Above groundwater-service piping NPS 4 and NPS 6 shall be any of the following:
   1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
   2. Ductile-iron, grooved-end pipe; ductile-iron, grooved-end appurtenances; and grooved joints.

H. Underground Fire-Service-Main Piping NPS 4 to NPS 8 shall be the following:
   1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

I. Aboveground and Vault Fire-Service-Main Piping NPS 4 to NPS 8 shall be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

3.3 VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
   1. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, resilient-seated gate valves with valve box.
   2. Underground Valves, NPS 4 and Larger, for Indicator Posts: UL/FMG, cast-iron, nonrising-stem gate valves with indicator post.
   3. Use the following for valves in vaults and aboveground:
      a. Gate Valves, NPS 2 and Smaller: Bronze, nonrising stem.
      b. Gate Valves, NPS 3 and Larger: AWWA, cast iron, OS&Y rising stem, metal seated AWWA, cast iron, OS&Y rising stem, resilient seated.

3.4 PIPING SYSTEMS - COMMON REQUIREMENTS

A. See Section 33 05 00 "Common Work Results for Utilities" for piping-system common requirements.

3.5 PIPING INSTALLATION

A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.

B. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.

C. Make connections larger than NPS 2 with tapping machine according to the following:

1. Install tapping sleeve and tapping valve according to MSS SP-60.
2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

D. Make connections NPS 2 and smaller with drilling machine according to the following:
1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
4. Install corporation valves into service-saddle assemblies.
5. Install manifold for multiple taps in water main.
6. Install curb valve in water-service piping with head pointing up and with service box.

E. Comply with NFPA 24 for fire-service-main piping materials and installation.
1. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

F. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

G. Bury piping with depth of cover over top at least 48 inches, with top at least 12 inches below level of maximum frost penetration.

H. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.
1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

I. Sleeves are specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

J. Mechanical sleeve seals are specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

K. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.6 JOINT CONSTRUCTION

A. See Section 33 05 00 "Common Work Results for Utilities" for basic piping joint construction.

B. Make pipe joints according to the following:
1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
2. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
3. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.

4. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

3.7 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
   1. Concrete thrust blocks.
   2. Locking mechanical joints.
   3. Bolted flanged joints.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
   1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
   2. Fire-Service-Main Piping: According to NFPA 24.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.8 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.

C. MSS Valves: Install as component of connected piping system.

D. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.9 WATER METER INSTALLATION

A. Install water meters, piping, and specialties according to utility company's written instructions.

3.10 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.

B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.

C. Do not install bypass piping around backflow preventers.

3.11 CONNECTIONS

A. See Section 33 05 00 "Common Work Results for Utilities" for piping connections to valves and equipment.

B. Connect water-distribution piping to [utility water main] [existing water main] <Insert piping system>. Use [tapping sleeve and tapping valve] [service clamp and corporation valve] <Insert method>.

C. Connect water-distribution piping to interior domestic water piping.

D. Connect waste piping from concrete vault drains to [sanitary sewerage system. See Section 22 13 13 "Facility Sanitary Sewers" for connection to sanitary-sewer] [storm-drainage system. See Section 33 44 00 "Storm Utility Drainage Piping" for connection to storm-sewer] piping.

3.12 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
   1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

3.13 IDENTIFICATION

3.14 CLEANING

A. Clean and disinfect water-distribution piping as follows:
   1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
   2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
   3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
      a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
      b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
      c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.

d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION 221113

SECTION 22 11 16 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. Ductile-iron pipe and fittings.
3. Galvanized steel pipe and fittings.
4. Piping joining materials.
5. Transition fittings.
6. Dielectric fittings.

B. Related Requirements:

1. Section 221113 "Facility Water Distribution Piping" for water-service piping and water meters outside the building from source to the point where water-service piping enters the building.

1.2 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.3 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Include marking "NSF-pw" on piping.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn temper.

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

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

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

E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

F. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

G. Copper, Brass, or Bronze Pressure-Seal-Joint Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
   b. Elkhart Products Corporation.
   c. Mueller Industries, Inc.
   d. NIBCO INC.
   e. Viega LLC.

2. Fittings: Cast-brass, cast-bronze, or wrought-copper with EPDM O-ring seal in each end. Sizes NPS 2-1/2 (DN 65)and larger with stainless steel grip ring and EPDM O-ring seal.

3. Minimum 200-psig (1379-kPa) working-pressure rating at 250 deg F (121 deg C).

2.3 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe:

1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Standard-Pattern, Mechanical-Joint Fittings:

1. AWWA C110/A21.10, ductile or gray iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

C. Compact-Pattern, Mechanical-Joint Fittings:

1. AWWA C153/A21.53, ductile iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Central Plastics Company.
b. Matco-Norca.
c. WATTS.
d. Wilkins.
e. Zurn Industries, LLC.

2. Standard: ASSE 1079.
3. Pressure Rating: 150 psig (1035 kPa).
4. End Connections: Solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."

G. Install domestic water piping level without pitch and plumb.

H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

I. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

M. Install piping to permit valve servicing.

N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

O. Install piping free of sags and bends.

P. Install fittings for changes in direction and branch connections.

Q. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

R. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."

S. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123 "Domestic Water Pumps."

T. Install thermometers on outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

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

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM 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. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

G. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

H. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 (DN 40) and Smaller: Fitting-type coupling.
2. Fittings for NPS 2 (DN 50) and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 (DN 50) and Smaller: Plastic-to-metal transition unions.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric couplings or unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.

D. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

3.6 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for hangers, supports, and anchor devices in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.

c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install hangers for copper or ductile iron piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Support horizontal piping within 12 inches (300 mm) of each fitting.

E. Support vertical runs of copper, ductile iron piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

    a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
    b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

        1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
        2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

    c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
    d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

    a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
    b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
    c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
    d. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
    e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
    f. Prepare reports for tests and for corrective action required.

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

C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 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 (50 mg/L) 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 (200 mg/L) of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Repeat procedures if biological examination shows contamination.
e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building-service piping, NPS 3 (DN 80) and smaller, shall be one of the following:

1. Soft copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); wrought-copper, solder-joint fittings; and brazed copper pressure-seal fittings; and pressure-sealed joints.

E. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 8 (DN 100 to DN 200) and larger, shall be one of the following:

1. Soft copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); wrought-copper, solder-joint fittings; and brazed joints.
2. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.

F. Under-building-slab, combined domestic water, building-service, and fire-service-main piping, NPS 6 to NPS 12 (DN 150 to DN 300), shall be one of the following:

1. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.

G. Under-building-slab, domestic water piping, NPS 2 (DN 50) and smaller, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); wrought-copper, solder-joint fittings; and brazed copper pressure-seal-joint fittings; and pressure-sealed joints.

H. Aboveground domestic water piping, NPS 2 (DN 50) and smaller, shall be one of the following:
1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); wrought-copper, solder-joint fittings; and soldered joints.
2. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); copper pressure-seal-joint fittings; and pressure-sealed joints.
3. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); copper push-on-joint fittings; and push-on joints.

I. Aboveground domestic water piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100), shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought-copper, solder-joint fittings; and brazed soldered joints.
2. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); copper pressure-seal-joint fittings; and pressure-sealed joints.
3. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); grooved-joint, copper-tube appurtenances; and grooved joints.

J. Aboveground domestic water piping, NPS 5 to NPS 8 (DN 125 to DN 200), shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought-copper, solder-joint fittings; and brazed soldered joints.
2. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); grooved-joint, copper-tube appurtenances; and grooved joints.

K. Aboveground, combined domestic water-service and fire-service-main piping, NPS 6 to NPS 12 (DN 150 to (DN 300), shall be one of the following:

1. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.
2. Galvanized-steel pipe and nipples; galvanized, gray-iron threaded fittings; and threaded joints.

END OF SECTION 221116

SECTION 22 11 19- DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated, water mixing valves.
6. Strainers.
7. Outlet boxes.
8. Hose stations.
9. Hose bibbs.
10. Wall hydrants.
11. Drain valves.
12. Water-hammer arresters.
13. Air vents.
14. Trap-seal primer valves.
15. Trap-seal primer systems.
16. Specialty valves.
17. Water meters.

B. Related Requirements:
1. Section 22 05 19 "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
2. Section 22 11 16 "Domestic Water Piping" for water meters.
3. Section 22 32 00 "Domestic Water Filtration Equipment" for water filters in domestic water piping.
4. Section 22 43 00 "Medical Plumbing Fixtures" for thermostatic mixing valves for sitz baths, thermostatic mixing-valve assemblies for hydrotherapy equipment, and outlet boxes for dialysis equipment.
5. Section 22 45 00 "Emergency Plumbing Fixtures" for water tempering equipment.
6. Section 22 47 13 "Drinking Fountains" for water filters for water coolers.
7. Section 22 47 16 "Pressure Water Coolers" for water filters for water coolers.
8. Section 22 47 23 "Remote Water Coolers" for water filters for water coolers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For domestic water piping specialties.
1. Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 Annex G.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Hose-Connection Vacuum Breakers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Apollo Valves; Conbraco Industries, Inc.
   b. MIFAB, Inc.
   c. WATTS.
   d. Woodford Manufacturing Company.
   e. Zurn Industries, LLC.
2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Chrome or nickel plated.

2.4 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Ames Fire & Waterworks; A WATTS Brand.
   b. Apollo Valves; Conbraco Industries, Inc.
   c. WATTS.
   d. Zurn Industries, LLC.
2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle third of flow range.
5. Size: 4” NPS>.
6. Design Flow Rate: 130 gpm.
7. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
8. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.

9. Configuration: Designed for horizontal, straight-through flow.
10. Accessories:
    a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
    b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
    c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Reduced-Pressure-Detector, Fire-Protection, Backflow-Preventer Assemblies:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Ames Fire & Waterworks; A WATTS Brand.
    b. Apollo Valves; Conbraco Industries, Inc.
    c. WATTS.
    d. Zurn Industries, LLC.
2. Standard: ASSE 1047 and is FM Global approved or UL listed.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle third of flow range.
5. Size: 6" NPS.
6. End Connections: Flanged.
7. Configuration: Designed for horizontal, straight-through flow.
8. Accessories:
    a. Valves: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
    b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.
    c. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

2.5 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Apollo Valves; Conbraco Industries, Inc.
    b. WATTS.
    c. Zurn Industries, LLC.
2. Standard: ASSE 1003.
3. Pressure Rating: Initial working pressure of 150 psig.
4. Size: 4" NPS.
5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
6. Valves for Booster Heater Water Supply: Include integral bypass.
7. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.6 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Armstrong International, Inc.
    b. NIBCO INC.
    c. TACO Comfort Solutions, Inc.

d. WATTS.
2. Type: Ball or Y-pattern globe valve with two readout ports and memory-setting indicator.
3. Body: Brass or bronze.
4. Size: Same as connected piping, but not larger than NPS 2.
5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

B. Cast-Iron Calibrated Balancing Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Flo Fab Inc.
b. NIBCO INC.
c. WATTS.
2. Type: Adjustable with Y-pattern globe valve, two readout ports, and memory-setting indicator.
3. Size: Same as connected piping, but not smaller than NPS 2-1/2.

C. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

D. Memory-Stop Balancing Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Apollo Valves; Conbraco Industries, Inc.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. NIBCO INC.
2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
3. Pressure Rating: 400-psig minimum CWP.
4. Size: NPS 2 or smaller.
5. Body: Copper alloy.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass.
8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

2.7 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Leonard Valve Company.
b. Symmons Industries, Inc.
c. WATTS.
d. Zurn Industries, LLC.
2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig.
4. Type: Thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.

8. Tempered-Water Setting: 120 deg F.
9. Valve Finish: Rough bronze.

B. Individual-Fixture, Water Tempering Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Lawler Manufacturing Company, Inc.
   b. Leonard Valve Company.
   c. POWERS; A WATTS Brand.
   d. WATTS.
   e. Zurn Industries, LLC.
2. Standard: ASSE 1016, thermostatically controlled, water tempering valve.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.
8. Tempered-Water Setting: 105 deg F.

2.8 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:
1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:
   a. Strainers NPS 2 and Smaller: 0.020 inch.
   b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.
   c. Strainers NPS 5 and Larger: 0.10 inch.
6. Drain: Pipe plug.

2.9 HOSE BIBBS

A. Hose Bibbs:
1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Operating key.

14. Include operating key with each operating-key hose bibb.
15. Include wall flange with each chrome- or nickel-plated hose bibb.

2.10 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Jay R. Smith Mfg. Co.
   b. MIFAB, Inc.
   c. WATTS.
   d. Woodford Manufacturing Company.
   e. Zurn Industries, LLC.
2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4 or NPS 1.
7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounted with cover.
9. Box and Cover Finish: Polished nickel bronze.
10. Operating Keys(s): Two with each wall hydrant.

B. Vacuum Breaker Wall Hydrants:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Jay R. Smith Mfg. Co.
   b. WATTS.
   c. Woodford Manufacturing Company.
   d. Zurn Industries, LLC.
2. Standard: ASSE 1019, Type A or Type B.
3. Type: Freeze-resistant, automatic draining with integral air-inlet valve.
4. Classification: Type A, for automatic draining with hose removed or Type B, for automatic draining with hose removed or with hose attached and nozzle closed.
5. Pressure Rating: 125 psig.
6. Operation: Loose key.
7. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
8. Inlet: NPS 1/2 or NPS 3/4.
9. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

2.11 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:
1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.

8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Gate-Valve-Type, Hose-End Drain Valves:
1. Standard: MSS SP-80 for gate valves.
2. Pressure Rating: Class 125.
3. Size: NPS 3/4.
4. Body: ASTM B 62 bronze.
5. Inlet: NPS 3/4 threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

C. Stop-and-Waste Drain Valves <Insert drawing designation if any>:
1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig minimum CWP or Class 125.
3. Size: NPS 3/4.
4. Body: Copper alloy or ASTM B 62 bronze.
5. Drain: NPS 1/8 side outlet with cap.

2.12 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Jay R. Smith Mfg. Co.
b. MIFAB, Inc.
c. WATTS.
d. Zurn Industries, LLC.
e. Precision Plumbing Products
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.13 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Jay R. Smith Mfg. Co.
b. MIFAB, Inc.
c. Precision Plumbing Products.
d. Zurn Industries, LLC.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.14 TRAP-SEAL PRIMER SYSTEMS

A. Trap-Seal Primer Systems:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Precision Plumbing Products.
      b. Zurn Industries, LLC.
   2. Standard: ASSE 1044.
   3. Piping: NPS 3/4, ASTM B 88, Type L; copper, water tubing.
   4. Cabinet: Surface-mounted steel box with stainless-steel cover.
   5. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.
      a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   6. Vacuum Breaker: ASSE 1001.
   7. Number Outlets: Four.
   8. Size Outlets: NPS 1/2.

2.15 WATER METERS

A. Compound-Type Water Meters: Coordinate with utility company
   1. Description:
      a. Standard: AWWA C702.
      b. Pressure Rating: 150-psig working pressure.
      c. Body Design: With integral mainline and bypass meters; totalization meter.
      d. Registration: In gallons or cubic feet as required by utility company.
      e. Case: Bronze.
      f. Pipe Connections: Flanged.

B. Remote Registration System: Direct-reading type complying with AWWA C706; modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly as required by utility company.

C. Remote Registration System: Encoder type complying with AWWA C707; modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly as required by utility company.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
   1. Locate backflow preventers in same room as connected equipment or system.
   2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.

3. Do not install bypass piping around backflow preventers.

B. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.

C. Install water-control valves with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.

D. Install balancing valves in locations where they can easily be adjusted.

E. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
1. Install cabinet-type units recessed in or surface mounted on wall as specified.

F. Install Y-pattern strainers for water on supply side of each control valve water pressure-reducing valve.

G. Install water-hammer arresters in water piping according to PDI-WH 201.

H. Install air vents at high points of water piping.

I. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

J. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

K. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

3.2 CONNECTIONS

A. Comply with requirements for ground equipment in Section 26 05 26 "Grounding and Bonding for Electrical Systems."

B. Fire-retardant-treated-wood blocking is specified in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
1. Reduced-pressure-principle backflow preventers.
2. Reduced-pressure-detector, fire-protection, backflow-preventer assemblies.
3. Water pressure-reducing valves.
4. Calibrated balancing valves.
5. Primary, thermostatic, water mixing valves.
6. Primary water tempering valves.
7. Trap-seal primer systems.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 221119

SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Hub-and-spigot, cast-iron soil pipe and fittings
   2. Copper tube and fittings.
   3. Hubless, cast iron soil Pipe and fittings
   4. Specialty pipe fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sustainable Design Submittals:
   1. Product Data: For adhesives, indicating VOC content.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
   1. Soil, Waste, and Vent Piping: 10-foot head of water.

2.2 PIPING MATERIALS

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

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. CISPI, Hubless-Piping Couplings:

C.
1. Standards: ASTM C 1277 and CISPI 310.
2. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.5 COPPER TUBE AND FITTINGS

A. Copper Type DWV Tube: ASTM B 306, drainage tube, drawn temper.

B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

C. Copper Pressure Fittings:
1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. 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.

D. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

E. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.6 SPECIALTY PIPE FITTINGS

A. Transition Couplings:
1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
2. Unshielded, Nonpressure Transition Couplings:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1. Fernco Inc.
      2. Froet Industries LLC.
      3. Mission Rubber Company, LLC; a division of MCP Industries.
   b. Standard: ASTM C 1173.

c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
d. End Connections: Same size as and compatible with pipes to be joined.
e. Sleeve Materials:

1. For Cast-Iron Soil Pipes: ASTM C 564, rubber.

3. Shielded, Nonpressure Transition Couplings:
a. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Cascade Waterworks Mfg. Co.
b. Standard: ASTM C 1460.
c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
d. End Connections: Same size as and compatible with pipes to be joined.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 31 20 00 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
   1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
   2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
      a. Straight tees, elbows, and crosses may be used on vent lines.
   3. Do not change direction of flow more than 90 degrees.
   4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
      a. Reducing size of waste piping in direction of flow is prohibited.

K. Lay buried building waste piping beginning at low point of each system.
   1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
   2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
   3. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
   1. Building Sanitary Waste: 2 percent downward in direction of flow for piping NPS 2 and smaller; 1 percent downward in direction of flow for piping NPS 3 and larger.
   2. Horizontal Sanitary Waste Piping: 1 percent downward in direction of flow.
   3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

N. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

O. Plumbing Specialties:
   1. Install backwater valves in sanitary waster gravity-flow piping.
      a. Comply with requirements for backwater valves specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
   2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
      a. Comply with requirements for cleanouts specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
   3. Install drains in sanitary waste gravity-flow piping.
      a. Comply with requirements for drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."

P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

Q. Install sleeves for piping penetrations of walls, ceilings, and floors.
   1. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

R. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

S. Install escutcheons for piping penetrations of walls, ceilings, and floors.
   1. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

C. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.
   1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:
   1. Install transition couplings at joints of piping with small differences in ODs.
   2. In Waste Drainage Piping: Shielded, nonpressure transition couplings.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
   1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
   2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
   3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
   4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
   5. Vertical Piping: MSS Type 8 or Type 42, clamps.
   6. Install individual, straight, horizontal piping runs:
      a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
      b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
      c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
   7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
   8. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
   2. NPS 3: 60 inches with 1/2-inch rod.
   3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
   4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
   5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
   6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

F. Install supports for vertical cast-iron soil piping every 15 feet.

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 and NPS 8: 12 feet with 3/4-inch rod.
   8. NPS 10 and 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 and 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. Support piping and tubing not listed above according to MSS SP-58 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect waste and vent piping to the following:
   1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
   2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
   3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
   4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:
   1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
   2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping.

B. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.8 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 waste 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.
      a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.

a. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
   a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
   b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
   c. 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.
   a. 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.
   b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
   c. Air pressure must remain constant without introducing additional air throughout period of inspection.
   d. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Repair damage to adjacent materials caused by waste and vent piping installation.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:
   1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   2. Copper Type DWV tube, copper drainage fittings, and soldered joints.
   3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Aboveground, soil and waste piping NPS 5 and larger shall be any of the following:
   1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

D. Aboveground, vent piping NPS 4 and smaller shall be any of the following:
   1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   2. Copper Type DWV tube, copper drainage fittings, and soldered joints.
      a. Option for Vent Piping, NPS 2-1/2 and NPS 3-1/2: Hard copper tube, Type M; copper pressure fittings; and soldered joints.
   3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

E. Aboveground, vent piping NPS 5 and larger shall be any of the following:
   1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

F. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:
   1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
   2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

G. Underground, soil and waste piping NPS 5 and larger shall be any of the following:
   1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
   2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 221316

SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Roof flashing assemblies.
   2. Miscellaneous sanitary drainage piping specialties.

1.2 DEFINITIONS

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

2.2 CLEANOUTS

A. Cast-Iron Exposed Cleanouts:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Jay R. Smith Mfg. Co.
      b. Josam Company.
      c. MIFAB, Inc.
      d. Zurn
   2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
   3. Size: Same as connected drainage piping
   4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch Hubless, cast-iron soil pipe test tee as required to match connected piping.
   5. Closure: Countersunk or raised-head, brass cast-iron 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. Cast-Iron Exposed Floor Cleanouts:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Jay R. Smith Mfg. Co.
      b. Josam Company.
      c. Tyler Pipe; a subsidiary of McWane Inc.
      d. Watts; a Watts Water Technologies company.
      e. Zurn
   2. Standard: ASME A112.36.2M for adjustable housing cast-iron soil pipe with cast-iron ferrule heavy-duty, adjustable housing threaded, adjustable housing cleanout.
   3. Size: Same as connected branch.
   4. Type: Adjustable housing Cast-iron soil pipe with cast-iron ferrule Heavy-duty, adjustable housing Threaded, adjustable housing.
   5. Body or Ferrule: Cast iron.
   6. Clamping Device: Required.
   7. Outlet Connection: Inside calk Spigot Threaded.
   8. Closure: Brass plug with straight threads and gasket.
   9. Adjustable Housing Material: Cast iron with threads.
   10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
   11. Frame and Cover Shape: Round, Square.
   12. Top Loading Classification: Heavy Duty.
   13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to clean out.

C. Cast-Iron Wall Cleanouts:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Jay R. Smith Mfg. Co.
      b. MIFAB, Inc.
      c. Tyler Pipe; a subsidiary of McWane Inc.
      d. Watts; a Watts Water Technologies company.
      e. Zurn
   2. Standard: ASME A112.36.2M. Include wall access.
   3. Size: Same as connected drainage piping.
   4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
   5. Closure Plug:
      a. Brass, Cast iron.
      b. Countersunk or raised head.
      c. Drilled and threaded for cover attachment screw.
      d. Size: Same as or not more than one size smaller than cleanout size.
   6. Wall Access: Round, deep, chrome-plated bronze cover plate with screw.
   7. Wall Access: Round, Square, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Acorn Engineering Company.
      b. Thaler Metal Industries Ltd.

2. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch-6.0-lb/sq. ft., 0.0938-inch-thick, lead flashing collar and skirt extending at least 6 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
   a. Open-Top Vent Cap: Without cap.
   b. Low-Silhouette Vent Cap: With vandal-proof vent cap.
   c. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.4 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 or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
   2. Size: Same as connected waste piping.
      a. NPS 2: 4-inch-minimum water seal.
      b. NPS 2-1/2 and Larger: 5-inch-minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings:
   1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
   2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

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

E. Sleeve Flashing Device:
   1. Description: Manufactured, cast-iron fitting, with clamping device that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
   2. Size: As required for close fit to riser or stack piping.

F. Stack Flashing Fittings:
   1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
   2. Size: Same as connected stack vent or vent stack.

G. Vent Caps:
   1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.

2. Size: Same as connected stack vent or vent stack.

H. Expansion Joints:
1. Standard: ASME A112.6.4.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof. Comply with requirements in Section 07 62 00, Sheet Metal Flashing and Trim.

E. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof. Comply with requirements in Section 07 62 00, Sheet Metal Flashing and Trim.

F. Assemble open drain fittings and install with top of hub 1 inch above floor.

G. Install deep-seal traps on floor drains and other waste outlets, if indicated.

H. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

I. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

J. Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane.

K. Install vent caps on each vent pipe passing through roof.

L. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

M. Install wood-blocking reinforcement for wall-mounting-type specialties.

N. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 22 13 16 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FLASHING INSTALLATION

A. Comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim."

B. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required.

C. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
   1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
   2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
   3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

D. Set flashing on floors and roofs in solid coating of bituminous cement.

E. Secure flashing into sleeve and specialty clamping ring or device.

F. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 07 62 00 "Sheet Metal Flashing and Trim."

G. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.
   1. Nameplates and signs are specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 22 13 19.13- SANITARY DRAINS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Floor drains.
   2. Trench drains.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 DRAIN ASSEMBLIES

A. Sanitary drains shall bear label, stamp, or other markings of specified testing agency.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Jay R. Smith Mfg. Co.
      b. MIFAB, Inc.
      c. Watts; a Watts Water Technologies company.
      d. Zurn
   2. Standard: ASME A112.6.3.
   3. Pattern: [Floor] drain.
   4. Body Material: Gray iron.
   5. Seepage Flange: Required.
   6. Anchor Flange: Required.
   7. Clamping Device: Required.
   8. Outlet: Bottom.
   9. Refer to drawing for basis of design
   10. Sediment Bucket:
   11. Funnel: where required
   12. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
   13. Trap Material: Bronze Cast iron.
   14. Trap Pattern: Deep-seal P-trap or Standard P-trap.
   15. Trap Features: Trap-seal primer valve drain connection.

PART 3 - EXECUTION

3.1 INSTALLATION

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

B. Install open drain fittings with top of hub 1 inch above floor.

3.2 CONNECTIONS

A. Comply with requirements in Section 22 13 16 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Comply with requirements in Section 22 13 19 "Sanitary Waste Piping Specialties" for backwater valves, air admittance devices and miscellaneous sanitary drainage piping specialties.

C. Comply with requirements in Section 22 13 23 "Sanitary Waste Interceptors" for grease interceptors, grease-removal devices, oil interceptors, sand interceptors, and solid interceptors.

D. Install piping adjacent to equipment to allow service and maintenance.

E. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

F. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.3 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319.13

Sanitary Sump
SUBMERSIBLE WASTEWATER PUMP

Furnish and install,where shown on the plans, one Liberty Pumps, LLC. SimplexSubmersible sewage pump. Contact Cullen Company (732-988-9600) for more information.

3048LSGX-Series Specifications

1.01 GENERAL
The contractor shall provide labor, material, equipment, and incidentals required to provide 1 (QTY) centrifugal grinder pump systems as specified herein. The pump models covered in this specification are LSG/LSGX-Series single-phase grinder pumps. The pump
furnished for this application shall be model 3048LSGX202-S-SC as manufactured by Liberty Pumps.

2.01 OPERATING CONDITIONS
Each submersible pump shall be rated at 2hp, 208/230 volts, 1-phase, 60 Hz, 3450 RPM. The unit shall produce 38 GPM at 10 feet of total dynamic head.

The submersible pump shall be capable of handling residential and commercial sewage and grinding it to a fine slurry enabling it to be pumped over long distances in pipelines as small as 1.25" in diameter. The LSGX-Series 2-stage submersible pump shall have a shut-off head of 185 feet and a maximum flowof 38GPM @ 10 feet of total dynamic head.

The pump shall be controlled with:
A piggyback style on/offfloat switch

3.01 CONSTRUCTION
Each centrifugal grinder pump shall be equal to the certified LSG/LSGX-Series Grinder pumps as manufactured by Liberty Pumps, Bergen NY. The castings shall be constructed of class 25 cast iron. The motor housing shall be oil filled to dissipate heat. Air filled motors shall not be considered equal since they do not properly dissipate heat from the motor. All mating parts shall be machined and sealed with a Buna-N O-ring. All fasteners exposed to the liquid shall be stainless steel. The motor shall be protected on the top side with sealed cord entry plate with molded pins to conduct electricity eliminating the ability of water to enter internally through the cord. The motor shall be protected on the lower side with a dual seal arrangement. The first seal is a double lip seal molded in fluoroelastomer. The second/main seal shall be a unitized hard face silicon carbide seal with stainless steel housings and spring.

The upper and lower bearing shall be capable of handling all radial thrust loads. The lower bearing shall have the additional ability to handle the downward axial thrust produced by the impeller and cutters by design of angular contact roller races. The pump housing shall be of the concentric design thereby equalizing the pressure forces inside the housing, which will extend the service life of the seals and bearings. Additionally there shall be no cutwater in the housing volute in order to discourage the entrapment of flowing debris. The pump shall be furnished with a stainless steel handle having a nitrile grip.

4.01 ELECTRICAL POWER CORD

The submersible pump shall be supplied with 25feet of multi-conductor power cord. It shall be cord type SJOOW, capable of continued exposure to the pumped liquid. The power cord shall be sized for the rated full load amps of the pump in accordance with the National Electric Code. The power cable shall not enter the motor housing directly but will conduct electricity to the motor by means of a water tight compression fitting cord plate assembly, with molded pins to conduct electricity. This eliminates the ability for water to enter internally through the cord by means of a damaged or wicking cord.

5.01 MOTORS

All motors shall be oil filled, capacitor start/capacitor run, class B insulated NEMA B design, rated for continuous duty. Since air filled motors are not capable of dissipating heat as effectively, they shall not be considered equal. At maximum load, the winding temperature shall not exceed 105°C for model LSG and 135°C for LSGX models (unsubmerged). The pump motor shall have an integral thermal overload switch in the windings for protecting the motor. The capacitor circuit shall be mounted internally in the pump. Single-phase motors shall have an integral solid state starting circuit switch for switching the start winding off.

6.01 BEARINGS AND SHAFT

An upper radial and a lower angular contact ball bearing shall be required. The upper bearing shall be a single ball/race type bearing. The lower bearing shall be an angular contact heavy duty ball/race type bearing, designed to handle axial grinder pump thrust loads. Both bearings shall be permanently lubricated by the oil that fills the motor housing. The bearing system shall be designed to enable proper cutter alignment from shut off head to maximum load at 10feet of TDH. The motor shaft shall be made of 300 series stainless steel and have a minimum diameter of 0.670".

7.01 SEALS

The pump shall have a dual seal arrangement consisting of a lower and upper seal to protect the motor from the pumping liquid. The lower seal shall be fluoroelastomer OR Buna-N molded

double lip seal, designed to exclude foreign material away from the main upper seal. The upper seal shall be a unitized silicon carbide hard face seal with stainless steel housings and spring equal to Crane Type T-6a. The motor plate/housing interface shall be sealed with a Buna-N O-ring.

8.01 IMPELLER

The impeller shall be an investment cast stainless steel impeller, with pump out vanes on the back shroud to keep debris away from the seal area. It shall be keyed and bolted to the motor shaft.

9.01 CUTTER MECHANISM

The cutter and plate shall consist of 440 stainless steel with a Rockwell C hardness of 55–60. The stationary cutter plate shall have specially designed orifices through it, which enable the slurry to flow through the pump housing at an equalized pressure and velocity. The stationary cutter shall consist of V shapes to maximize cutting action and arc shape exclusion slots to outwardly eject debris from under the rotary cutter. The rotary cutter shall have four (4) blades and be designed with a recessed area behind the cutting edge to prevent the accumulation and binding of any material between rotary cutter and the stationary cutter. The cutting system must incorporate close tolerances for optimum performance. Ring or radial cutters, or those that grind on the outside circumference, shall not be considered equal.

10.01 CONTROLS

All single-phase units shall be supplied with CSA and UL approved automatic wide angle tilt float switches. The switches shall be equipped with a piggyback style plug that allows the pump to be operated manually without the removal of the pump in the event that a switch becomes inoperable.

11.01 PAINT

The exterior of the casting shall be protected with powder coat paint.

12.01 SUPPORT

The pump shall have cast iron support legs, enabling it to be a freestanding unit. The legs shall be high enough to allow solids and long stringy debris to enter the cutter assembly.

13.01 SERVICEABILITY

Components required for the repair of the pump shall be shipped within a period of 24 hours.

14.01 FACTORY ASSEMBLED TANK SYSTEMS WITH GUIDE RAIL AND QUICK DISCONNECT DISCHARGE

Factory mounted guide rail system with pump suspended by means of bolt-on quick disconnect that is sealed by means of nitrile grommets. The Discharge piping shall be schedule 80 PVC and furnished with a check valve and PVC shut-off ball valve. The tank shall be wound fiberglass or roto-molded plastic. An inlet hub shall be provided with the system.

- Stainless steel guide rail
- 30" diameter of basin size
- 48" height of basin size
- 12" distance from top of tank to discharge pipe outlet
- 36" Steel cover
- Simplex system with outdoor panel and alarm
- Separate outdoor alarm

15.01 TESTING

The pump shall have a ground continuity check and the motor chamber shall be hi-potted to test for electrical integrity, moisture content, and insulation defects. The motor and volute housing shall be pressurized and an air leak decay test performed to ensure integrity of the motor housing. The pump shall be run, voltage current monitored, and checked for noise or other malfunction.

16.01 QUALITY CONTROL

The pump shall be manufactured in an ISO 9001 certified facility.

17.01 WARRANTY

Standard limited warranty shall be 3 years.

SECTION 22 33 00- ELECTRIC, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Commercial, Electric, storage, domestic-water heaters.
   2. Domestic-water heater accessories.

1.2 PERFORMANCE REQUIREMENTS

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:
   1. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of commercial, electric, domestic-water heater, from manufacturer.

B. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

C. Source quality-control reports.

D. Field quality-control reports.

E. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE/IESNA Compliance: domestic-water heaters to comply with ASHRAE/IESNA 90.1.

C. ASME Compliance:
1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.
2. Warranty Periods: From date of Substantial Completion.
a. Commercial, Electric, Storage, Domestic-Water Heaters:
1) Storage Tank: 5 years.
2) Controls and Other Components: 5 year(s).
b. Compression Tanks: Five years.

PART 2 - PRODUCTS

A. Commercial, Electric, Storage, Domestic-Water Heaters:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
a. A. O. Smith Corporation.
b. Bradford White Corporation.
c. Lochinvar, LLC.
d. PVI; A WATTS Brand.
2. Standard: UL 1453.
3. Storage-Tank Construction: ASME-code, steel vertical arrangement.
a. Tappings: Factory fabricated of materials compatible with tank and piping connections. Attach tappings to tank before testing.
1) NPS 2 (DN 50) and Smaller: Threaded ends in accordance with ASME B1.20.1.
2) NPS 2-1/2 (DN 65) and Larger: Flanged ends in accordance with ASME B16.5 for steel and stainless steel flanges, and in accordance with ASME B16.24 for copper and copper-alloy flanges.
b. Pressure Rating: 150 psig (1035 kPa).
c. Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining material into tappings.
4. Factory-Installed, Storage-Tank Appurtenances:
a. Anode Rod: Replaceable magnesium.

b. Drain Valve: Corrosion-resistant metal with hose-end connection.
c. Insulation: Comply with ASHRAE/IES 90.1.
d. Jacket: Steel with enameled finish or high-impact composite material.
e. Heating Elements: Electric, screw-in or bolt-on immersion type arranged in multiples of three.
f. Temperature Control: Adjustable thermostat.
g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
h. Relief Valves: ASME rated and stamped for combination temperature-and-pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than working-pressure rating of domestic-water heater. Select one relief valve with sensing element that extends into storage tank.

5. Special Requirements: NSF 5 construction.
6.

2.2 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AMTROL, Inc.
b. Honeywell Water Controls.
c. Smith, A. O. Corporation.
d. State Industries.
2. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
3. Construction:
a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
c. Air-Charging Valve: Factory installed.
4. Capacity and Characteristics:
a. Working-Pressure Rating: 150 psig.
b. Capacity Acceptable: 2 gal minimum.

B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 1 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.

C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.

D. Heat-Trap Fittings: ASHRAE 90.2.

A. Pressure-Reducing Valves: ASSE 1003 for water. Set at 25-psig- (172.5-kPa-) maximum outlet pressure unless otherwise indicated.

B. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than working-pressure

rating of domestic-water heater. Select relief valves with sensing element that extends into storage tank.

C. Pressure Relief Valves: ASME rated and stamped. Include pressure setting less than working-pressure rating of domestic-water heater.

D. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.

E. Shock Absorbers: ASSE 1010 or PDI-WH 201, Size A water hammer arrester.

F. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Include dimension that will support bottom of domestic-water heater a minimum of 18 inches (457 mm) above the floor.

G. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect assembled domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 01 40 00 "Quality Requirements" for retesting and reinspecting requirements and Section 01 73 00 "Execution" for requirements for correcting the Work.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in Section 03 30 00 "Cast-in-Place Concrete." Section 03 30 53 "Miscellaneous Cast-in-Place Concrete."
   1. Exception: Omit concrete bases for commercial domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
   2. Maintain manufacturer's recommended clearances.
   3. Arrange units so controls and devices that require servicing are accessible.
   4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
   5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
   6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   7. Install anchor bolts to elevations required for proper attachment to supported equipment.
   8. Anchor domestic-water heaters to substrate.

B. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
   1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping," Section 22 05 23.13 "Butterfly Valves for Plumbing Piping," and Section 22 05 23.15 "Gate Valves for Plumbing Piping."

C. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

D. Install combination temperature-and-pressure relief valves in water piping for domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

E. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 22 11 19 "Domestic Water Piping Specialties."

F. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."

G. Assemble and install inlet and outlet piping manifold kits for multiple domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each domestic-water heater outlet. Comply with requirements for valves specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping," Section 22 05 23.13 "Butterfly Valves for Plumbing Piping," and Section 22 05 23.15 "Gate Valves for Plumbing Piping," and comply with requirements for thermometers specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."

H. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.

I. Fill domestic-water heaters with water.

J. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
   2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 01 40 00 "Quality Requirements" for retesting and reinspecting requirements and Section 01 73 00 "Execution" for requirements for correcting the Work.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial, gas-fired, storage, domestic-water heaters.

END OF SECTION 223400

SECTION 22 42 13.13- COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Water closets.
   2. Toilet seats.
   3. Supports.

B. Related Requirements:

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water closets.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.
   1. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than six of each type.

PART 2 - PRODUCTS

2.1 WALL-MOUNTED, BOTTOM-OUTLET WATER CLOSETS

A. Water Closet (WC-1): Floor mounted, bottom outlet, 1-12” top spud. Model K-3493-SS, ADA compliant.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Kohler Co.
      b. Sloan Valve Company.

c. Zurn Industries, LLC.

2. Bowl:
   a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
   b. Material: Vitreous china.
   c. Type: Tank.
   d. Style: Assisted Flush.
   e. Height: 10-1/2" height bowl.
   f. Rim Contour: Elongated.
   g. 1-7/8" glazed trapway
   h. Water Consumption:1.28 TO 1.6 gal. per flush.
   i. Spud Size and Location: NPS 1-1/2; top.
   j. Color: White.
3. Bowl-to-Drain Connecting Fitting: ASTM A 1045 or ASME A112.4.3.
4. Flushometer Valve:
5. Toilet Seat:

2.2 TOILET SEATS

A. Toilet Seat with Scalloped handhold locations. Model no. K-4731.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Bemis Manufacturing Company.
      b. Church Seats; Bemis Manufacturing Company.
      c. Kohler Co.
      d. Zurn Industries, LLC.
   2. Standard: IAPMO/ANSI Z124.5.
   3. Material: Plastic.
   4. Type: Commercial (Standard).
   5. Shape: Elongated rim, open front.
   6. Hinge: Check.
   7. Hinge Material: Noncorroding metal.
   8. Seat Cover: Not required.
   9. Color: White.

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 water-closet installation.

B. Examine walls and floors for suitable conditions where water closets will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Water-Closet Installation:
   1. Install level and plumb according to roughing-in drawings.

2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:
1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
2. Use carrier supports with waste-fitting assembly and seal.
3. Install floor-mounted, back-outlet water closets attached to building floor substrate, onto waste-fitting seals; and attach to support.

C. Flushometer-Valve Installation:
1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install actuators in locations that are easy for people with disabilities to reach.
4. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

D. Install toilet seats on water closets.

E. Joint Sealing:
1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

3.3 CONNECTIONS

A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed water closets and fittings.

C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.13

SECTION 22 42 16.13- COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.1 SUMMARY

Section Includes:
1. Lavatories.
2. Faucets.
3. Supply fittings.
4. Waste fittings.
5. Supports.

Related Requirements:

1.2 ACTION SUBMITTALS

Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

1.3 CLOSEOUT SUBMITTALS

Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.
1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
   a. Servicing and adjustments of automatic faucets.

1.4 MAINTENANCE MATERIAL SUBMITTALS

Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

Lavatory: Vitreous china, wall mounted, with hanger, with overflow. Model no. K-1728-0

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Kohler Co.
   b. Sloan Valve Company.
   c. Zurn Industries, LLC.
2. Fixture:
   a. Standard: ASME A112.19.2/CSA B45.1. ADA.
   b. Type: For wall hanging.
   c. Nominal Size: Oval, 20”x18”
   d. Faucet-Hole Punching: Three holes, 4-inch centers.
   e. Faucet-Hole Location: Top.
   f. Color: White.
   g. Mounting Material: Chair carrier.
   h. 21-1/4”x18-1/8”
3. Faucet: Moen 8420
4. Support: Type II, concealed-arm lavatory carrier. Include rectangular, steel uprights.
5. Lavatory Mounting Height: Refer to architectural.

2.2 SOLID-BRASS, AUTOMATICALLY OPERATED LAVATORY FAUCETS

NSF Standard: Comply with NSF 372 for faucet materials that will be in contact with potable water.

Lavatory Faucets: Automatic-type, hard-wired, electronic-sensor-operated, solid-brass valve.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Chicago Faucets; Geberit Company.
   b. Hydrotek International, Inc.
   c. Sloan Valve Company.
   d. Speakman Company.
   e. Zurn Industries, LLC.
2. Standards: ASME A112.18.1/CSA B125.1 and UL 1951.
3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
4. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
5. Body Type: Single hole.
6. Body Material: Commercial, solid brass.
7. Finish: Polished chrome plate.
8. Maximum Flow Rate: 0.5 gpm.
9. Mounting Type: Deck, concealed.
10. Spout: Rigid type.
11. Spout Outlet: .
12. Drain: Not part of faucet.

2.3 SEEMLESS, ONE PIECE LAVATORIES SYSTEMS

Lavatory: Solid Surface

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Bradley
b. Acorn
c. Intersan

2. Fixture:
   a. Refer to drawing for basis of design
3. Faucet:

2.4 SUPPLY FITTINGS

NSF Standard: Comply with NSF 372 for supply-fitting materials that will be in contact with potable water.

Standard: ASME A112.18.1/CSA B125.1.

Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.

Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

Operation: Loose key.

Risers:
1. NPS 1/2.
2. Chrome-plated, rigid-copper-pipe and brass straight or offset tailpieces ASME A112.18.6, braided- or corrugated-stainless-steel, flexible hose riser.

2.5 WASTE FITTINGS

Standard: ASME A112.18.2/CSA B125.2.

Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.

Trap:
1. Size: NPS 1-1/2 by NPS 1-1/4.
2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated, brass or steel wall flange.
3. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch-thick stainless-steel tube to wall; and stainless-steel wall flange.

2.6 SUPPORTS

Type II Lavatory Carrier:
1. Standard: ASME A112.6.1M.

Type III Lavatory Carrier:
2. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.

Examine counters and walls for suitable conditions where lavatories will be installed.

Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

Install lavatories level and plumb according to roughing-in drawings.

Install supports, affixed to building substrate, for wall-mounted lavatories.

Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.

Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 22 07 19 "Plumbing Piping Insulation."

3.3 CONNECTIONS

Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."

Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

Adjust water pressure at faucets to produce proper flow.

Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

After completing installation of lavatories, inspect and repair damaged finishes.

Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

Provide protective covering for installed lavatories and fittings.

Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.13

SECTION 22 42 16.16- COMMERCIAL SINKS

PART 1 - GENERAL

1.1 SUMMARY

Section Includes:

1. Commercial Sink
2. Sink faucets.
3. Laminar-flow, faucet-spout outlets.
4. Supports.
5. Supply fittings.
6. Waste fittings.

Related Requirements:

7. Section 22 41 00 "Residential Plumbing Fixtures" for residential sinks.

1.2 ACTION SUBMITTALS

Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sinks.
2. Include rated capacities, operating characteristics and furnished specialties and accessories.

1.3 INFORMATIONAL SUBMITTALS

1.4 CLOSEOUT SUBMITTALS

Maintenance Data: For sinks to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 Commercial Sink

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2.
   a. Dayton Products, Inc.
   b. Elkay Manufacturing Co.
   c. Just Manufacturing Company.
   d. Kohler Co.
   e. Moen, Inc.
   f. Sterling Plumbing Group, Inc.
   g.
3. FIXTURE:
4.
   a. Under mount ADA sink
   b. Shape: Square.
   c. Size: 16-1/2”x 16-1/2” x 5-3/8”.
   d. Drain location: Rear center
   e. Material: Stainless Steel
   f. Drain: 3-1/2”.

2.2 SINK FAUCETS

1. Moen - 8287
2. Polished chrome , 8” centerline rigid or swing gooseneck spout, Lead Free.

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Chicago Faucets; Geberit Company.
2. Elkay Manufacturing Co.

3. T&S Brass and Bronze Works, Inc.

4. Zurn Industries, LLC.

5. Fiat

2.3 LAMINAR-FLOW, FAUCET-SPOUT OUTLETS

NSF Standard: Comply with NSF 372 for faucet-spout-outlet materials that will be in contact with potable water.

Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AM Conservation Group, Inc.
2. Chronomite Laboratories, Inc.
3. T&S Brass and Bronze Works, Inc.

Description: Chrome-plated brass, faucet-spout outlet that produces non-aerating, laminar stream. Include external or internal thread that mates with faucet outlet for attachment to faucets where indicated and flow-rate range that includes flow of faucet.

2.4 SUPPORTS

Type II Sink Carrier:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Jay R. Smith Mfg. Co.
   b. MIFAB, Inc.
   c. WATTS.
   d. Zurn Industries, LLC.
2. Standard: ASME A112.6.1M.

2.5 SUPPLY FITTINGS

NSF Standard: Comply with NSF 372 for supply-fitting materials that will be in contact with potable water.

Standard: ASME A112.18.1/CSA B125.1.

Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless-steel wall flange.

Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

Operation: Loose key.

Risers:

1. NPS 1/2.
2. Chrome-plated, rigid-copper pipe, ASME A112.18.6, braided or corrugated stainless-steel flexible hose.

2.6 WASTE FITTINGS

Standard: ASME A112.18.2/CSA B125.2.

Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.

Trap:

1. Size: NPS 1-1/2.
2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated brass or steel wall flange.
3. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch-thick stainless-steel tube to wall; and stainless-steel wall flange.

2.7 GROUT

Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

Characteristics: Nonshrink; recommended for interior and exterior applications.

Design Mix: 5000-psi, 28-day compressive strength.

Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.

Examine walls, floors, and counters for suitable conditions where sinks will be installed.

Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

Install sinks level and plumb according to roughing-in drawings.

Install supports, affixed to building substrate, for wall-hung sinks.

Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.

Set floor-mounted sinks in leveling bed of cement grout.

Install water-supply piping with stop on each supply to each sink faucet.

1. Exception: Use ball or gate valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping" and Section 22 05 23.15 "Gate Valves for Plumbing Piping."
2. Install stops in locations where they can be easily reached for operation.

Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 22 07 19 "Plumbing Piping Insulation."

3.3 CONNECTIONS

Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."

Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.

Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

After completing installation of sinks, inspect and repair damaged finishes.

Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

Provide protective covering for installed sinks and fittings.

Do not allow use of sinks 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. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. HVAC demolition.
9. Equipment installation requirements common to equipment sections.
10. Painting and finishing.
11. Concrete bases.
12. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

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. 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. Grooved Mechanical-Joint Fittings and Couplings:

H. Solvent Cements for Joining Plastic Piping:

1. CPVC Piping: ASTM F 493.
2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Available Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Eclipse, Inc.
d. Epco Sales, Inc.
e. Hart Industries, International, Inc.
f. Watts Industries, Inc.; Water Products Div.
g. Zurn Industries, Inc.; Wilkins Div.

2.5 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Available Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM or NBRinterlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating 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.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.7 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, Floor-Plate Type: Cast-iron floor plate.

F. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.8 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 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 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type 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 Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type and set screw.
h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed or exposed-rivet hinge and set screw.
j. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw.
l. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable PE sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than NPS 6.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

T. Verify final equipment locations for roughing-in.

U. 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 23 Sections specifying piping systems.

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

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

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. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

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

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install 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.

3.5 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.7 GROUTING

A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 230500

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace Motors that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Motors larger than 20 HP: Manufacturer's standard, but not less than five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Insulation: Class F.

J. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.

2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following hangers and supports for HVAC system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.

B. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 21 Section "Water-Based Fire-Suppression Systems" for pipe hangers for fire-protection piping.
3. Division 23 Section "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
4. Division 23 Section "Metal Ducts” for duct hangers and supports.

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.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems.

B. Shop Drawings:Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Pipe stands. Include Product Data for components.
4. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.3, "Structural Welding Code--Sheet Steel."
4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
5. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Available Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. Carpenter & Paterson, Inc.
3. Empire Industries, Inc.
4. ERICO/Michigan Hanger Co.
5. National Pipe Hanger Corporation.
6. PHD Manufacturing, Inc.
7. PHS Industries, Inc.
8. Piping Technology & Products, Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Available Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Unistrut Corp.; Tyco International, Ltd.
7.

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. Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: 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. Manufacturers:

    a. Hilti, Inc.
    b. ITW Ramset/Red Head.
    c. Masterset Fastening Systems, Inc.
    d. MKT Fastening, LLC.
    e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Available Manufacturers:

    a. B-Line Systems, Inc.; a division of Cooper Industries.
    b. Empire Industries, Inc.
    c. Hilti, Inc.
    d. ITW Ramset/Red Head.
    e. MKT Fastening, LLC.
    f. Powers Fasteners.

2.7 PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

1. Available Manufacturers:

    a. ERICO/Michigan Hanger Co.
    b. MIRO Industries.

C. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

2.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.9 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches 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. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
7. 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.
8. 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.

9. 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.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

a. Light (MSS Type 31): 750 lb.
b. Medium (MSS Type 32): 1500 lb.
c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

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.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

a. Horizontal (MSS Type 54): Mounted horizontally.
b. Vertical (MSS Type 55): Mounted vertically.
c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 Section "Roof Accessories" for curbs.

G. 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 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 B31.1 (for power piping) and 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 B31.1 for power piping and ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.

c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.

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 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. 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. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 230529

SECTION 230548 - VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Open-spring isolators.
4. Housed-spring isolators.
5. Pipe-riser resilient supports.
6. Resilient pipe guides.
7. Elastomeric hangers.
8. Spring hangers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Delegated-Design Submittal: For each vibration isolation device.

1. Include design calculations for selecting vibration isolators.

PART 2 - PRODUCTS

2.1 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:
1. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
2. Size: Factory or field cut to match requirements of supported equipment.
3. Pad Material: Oil and water resistant with elastomeric properties.
4. Surface Pattern: Smooth pattern.
5. Infused nonwoven cotton or synthetic fibers.
6. Load-bearing metal plates adhered to pads.

2.2 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts:

1. Mounting Plates:

    a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded.
    b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

2. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.3 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators:
    1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
    2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
    3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
    4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
    5. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig (.
    6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.4 HOUSED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing:
    1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
    2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
    3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
    4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
    5. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.

        a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
        b. Top housing with attachment and leveling bolt.

2.5 PIPE-RISER RESILIENT SUPPORT

A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch- thick neoprene

1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
2. Maximum Load Per Support: 500 psig on isolation material providing equal isolation in all directions.

2.6 RESILIENT PIPE GUIDES

A. Description: Telescopic arrangement of two steel tubes or post and sleeve arrangement separated by a minimum 1/2-inch- (13-mm-) thick neoprene

1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.7 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:

1.
2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
3. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.8 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:
1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.

8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

PART 3 - EXECUTION

3.1 VIBRATION CONTROL DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork.

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

END OF SECTION 230548

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Duct labels.
4. Valve 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: Aluminum, 0.032-inch or anodized aluminum, 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 or self-tapping screws.
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 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 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 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black

C. Background Color: Yellow

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 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 wire-link or beaded chain; or S-hook

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Chilled-Water Piping:

a. Background Color: Blue.
b. Letter Color: White.

2. Heating Water Piping:

a. Background Color: Red.
b. Letter Color: White.

3. Refrigerant Piping:

a. Background Color: Blue.
b. Letter Color: White.

3.4 DUCT LABEL INSTALLATION

A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For cold-air supply ducts.
2. Yellow: For hot-air supply ducts.
3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
4. ASME A13.1 Colors and Designs: For hazardous material exhaust.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Refrigerant: 1-1/2 inches, round.
b. Hot Water: 1-1/2 inches, round.

2. Valve-Tag Color:

a. Refrigerant: Natural.
b. Hot Water: Natural.

3. Letter Color:

a. Refrigerant: Black.
b. Hot Water: Black.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes TAB to produce design objectives for the following:

1. Air Systems:

    a. Constant-volume air systems.

2. Hydronic Piping Systems:

    a. Constant-flow systems.
    b. Variable-flow systems.
    c. Primary-secondary systems.
3. HVAC equipment quantitative-performance settings.
4. Verifying that automatic control devices are functioning properly.
5. Reporting results of activities and procedures specified in this Section.

1.3 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.

C. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.

D. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

E. NC: Noise criteria.

F. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

G. RC: Room criteria.

H. Report Forms: Test data sheets for recording test data in logical order.

I. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

J. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

K. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

L. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

M. TAB: Testing, adjusting, and balancing.

N. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

O. Test: A procedure to determine quantitative performance of systems or equipment.

P. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

1.4 SUBMITTALS

A. LEED Submittals:

1. Air Balance Report for Prerequisite EQ 1: Documentation of work performed for ASHRAE 62.1-2016, Section 7.2.2 - "Air Balancing."
2. TAB Report for Prerequisite EQ 1: Documentation of work performed for ASHRAE/IESNA 90.1-2016, Section 6.7.2.3 - "System Balancing."

B. Qualification Data: Within 30 days from Contractor's Notice to Proceed, submit 4 copies of evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

C. Contract Documents Examination Report: Within 30 days from Contractor's Notice to Proceed, submit 4 copies of the Contract Documents review report as specified in Part 3.

D. Strategies and Procedures Plan: Within 60 days from Contractor's Notice to Proceed, submit 4 copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation" Article. Include a complete set of report forms intended for use on this Project.

E. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

F. Sample Report Forms: Submit two sets of sample TAB report forms.

G. Warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by AABC, NEBB, or TABB.

B. TAB Conference: Meet with Owner's and Architect's representatives on approval of TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls installers, and other support personnel. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:

a. Submittal distribution requirements.
b. The Contract Documents examination report.
c. TAB plan.
d. Work schedule and Project-site access requirements.
e. Coordination and cooperation of trades and subcontractors.
f. Coordination of documentation and communication flow.

C. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard forms from SMACNA's TABB "HVAC Systems - Testing, Adjusting, and Balancing."

E. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

F. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

G. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2016, Section 7.2.2 - "Air Balancing."

H. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2016, Section 6.7.2.3 - "System Balancing."

1.6 PROJECT CONDITIONS

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.8 WARRANTY

A. National Project Performance Guarantee: Provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of Contract.
2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine Project Record Documents described in Division 01 Section "Project Record Documents."

D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and their controls are connected and functioning.

L. Examine plenum ceilings used for supply air to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.

M. Examine strainers for clean screens and proper perforations.

N. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

O. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

P. Examine system pumps to ensure absence of entrained air in the suction piping.

Q. Examine equipment for installation and for properly operating safety interlocks and controls.

R. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices are operated by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
6. Sensors are located to sense only the intended conditions.
7. Sequence of operation for control modes is according to the Contract Documents.
8. Controller set points are set at indicated values.
9. Interlocked systems are operating.
10. Changeover from heating to cooling mode occurs according to indicated values.

S. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in TABB "HVAC Systems - Testing, Adjusting, and Balancing" and this Section.

1. Comply with requirements in ASHRAE 62.1-2007, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

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. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

E. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling unit components.

L. Check for proper sealing of air duct system.

3.5 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.6 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.7 PROCEDURES FOR HEAT-TRANSFER COILS

A. Refrigerant Coils: Measure the following data for each coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.8 PROCEDURES FOR TEMPERATURE MEASUREMENTS

A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of two successive eight-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

C. Measure outside-air, wet- and dry-bulb temperatures.

3.9 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Check the operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Check free travel and proper operation of control devices such as damper and valve operators.

F. Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.

G. Check the interaction of electrically operated switch transducers.

H. Check the interaction of interlock and lockout systems.

I. Check main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or nongrounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.10 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:
   1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
   2. Air Outlets and Inlets: Plus or minus 10 percent.
   3. Heating-Water Flow Rate: Plus or minus 10 percent.

3.11 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.12 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

   1. Include a list of instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to certified field report data, include the following:

   1. Pump curves.
   2. Fan curves.
   3. Manufacturers' test data.
   4. Field test reports prepared by system and equipment installers.
   5. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

   1. Title page.
   2. Name and address of TAB firm.

3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outside, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

F. Apparatus-Coil Test Reports:

1. Coil Data:

    a. System identification.

b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch o.c.
f. Make and model number.
g. Face area in sq. ft..
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outside-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.
f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Water flow rate in gpm.
i. Water pressure differential in feet of head or psig.
j. Entering-water temperature in deg F.
k. Leaving-water temperature in deg F.
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig.
n. Refrigerant suction temperature in deg F.

G. Gas-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

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 Btuh.
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, and bore.
n. Sheave dimensions, center-to-center, and amount of adjustments in inches.

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 Btuh.
    i. High-fire fuel input in Btuh.
    j. Manifold pressure in psig.
    k. High-temperature-limit setting in deg F.
    l. Operating set point in Btuh.
    m. Motor voltage at each connection.
    n. Motor amperage for each phase.
    o. Heating value of fuel in Btuh.

H. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

    a. System identification.
    b. Location.
    c. Make and type.
    d. Model number and size.
    e. Manufacturer's serial number.
    f. Arrangement and class.
    g. Sheave make, size in inches, and bore.
    h. Sheave dimensions, center-to-center, and amount of adjustments in inches.

2. Motor Data:

    a. Make and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches, and bore.
    f. Sheave dimensions, center-to-center, and amount of adjustments in inches.
    g. Number of belts, make, and size.

3. Test Data (Indicated and Actual Values):

    a. Total airflow rate in cfm.
    b. Total system static pressure in inches wg.
    c. Fan rpm.
    d. Discharge static pressure in inches wg.

e. Suction static pressure in inches wg.

I. Round and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft..
g. Indicated airflow rate in cfm.
h. Indicated velocity in fpm.
i. Actual airflow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

J. Instrument Calibration Reports:

1. Report Data:

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

3.13 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.
2. Randomly check the following for each system:

a. Measure airflow of at least 10 percent of air outlets.
b. Measure water flow of at least 5 percent of terminals.
c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
d. Measure sound levels at two locations.
e. Measure space pressure of at least 10 percent of locations.
f. Verify that balancing devices are marked with final balance position.
g. Note deviations to the Contract Documents in the Final Report.

B. Final Inspection:

1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect.
2. TAB firm test and balance engineer shall conduct the inspection in the presence of Architect.
3. Architect shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10 percent of the total measurements recorded, or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
6. TAB firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.
7. Request a second final inspection. If the second final inspection also fails, Owner shall contract the services of another TAB firm to complete the testing and balancing in accordance with the Contract Documents and deduct the cost of the services from the final payment.

3.14 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional testing, inspecting, and adjusting during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230702 - HVAC EQUIPMENT INSULATION

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 blanket, board, and block insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

B. Related Sections include the following:

1. Section "Duct Insulation" for insulation materials and application for ducts and plenums.
2. Section "Pipe Insulation" for insulation for piping systems.

1.3 SUBMITTALS

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

B. LEED Submittal:

1. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content.

C. Shop Drawings: Show fabrication and installation details for the following:

1. Field application for each equipment type.
2. Removable insulation sections at access panels.
3. Application of field-applied jackets.
4. Special shapes for cellular-glass insulation.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.

E. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Qualified, authorized, and trained by manufacturer to install manufacturer's products, and who has completed installations similar in design, scope and scale to those indicated for this Project.
2. Certified by Insulation Contractors Association of America as a Commercial Building Insulation Contractor in good standing.
3. Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.

B. Insulation Materials: Insulation materials manufacturing facilities must be certified and registered with an approved registrar for conformance with ISO 9000 Quality Standard.

C. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Flame Spread Rating: Duct coverings, duct linings, duct tape, fasteners, and adhesives shall have a flame-spread rating of 25 or less, and smoke-developed rating of 50 or less when tested in accordance with ASTM E84.
2. Hot Surface Performance: Duct coverings, duct linings, duct tape, fasteners, and adhesives shall not flame, smolder, or smoke when tested at their rated temperatures in accordance with ASTM C411. The temperature of the test shall not be less than 250 degrees F.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate clearance requirements with equipment Installer for insulation application.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mineral-Fiber Insulation:

    a. CertainTeed.
    b. Knauf FiberGlass.
    c. Owens-Corning Fiberglas Corp.
    d. Johns Manville Corp.

2. PVC Jackets and Fittings:

    a. Zeston 2000
    b. Ceel-Co.

2.2 INSULATION MATERIALS

A. Mineral-Fiber Board Thermal Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or IB, with factory-applied facing of ASJ (all-service jacket).

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I

B. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK (foil scrim kraft) jacket.

1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.3 FIELD-APPLIED JACKETS

A. General: ASTM C 921, Type 1, unless otherwise indicated.

B. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

C. PVC Jacket: High-impact, ultraviolet-resistant PVC; 20 mils thick; roll stock ready for shop or field cutting and forming.

1. Adhesive: As recommended by insulation material manufacturer.
2. PVC Jacket Color: White or gray.
3. PVC Jacket Color: Color-code to match connected piping jackets based on materials contained within the piping system.

D. Aluminum Jacket: Deep corrugated sheets manufactured from aluminum alloy complying with ASTM B 209, and having an integrally bonded moisture barrier over entire surface in contact with insulation. Metal thickness and corrugation dimensions are scheduled at the end of this Section.

1. Finish: Smooth/embossed finish.
2. Moisture Barrier: 1-mil thick, heat-bonded polyethylene and kraft paper.

2.4 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8-oz./sq. yd.

1. Tape Width: 4 inches.

B. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:

1. Stainless Steel: ASTM A 666, Type 304; 0.020 inch thick.
2. Galvanized Steel: 0.005 inch thick.
3. Aluminum: 0.007 inch thick.
4. Brass: 0.010 inch thick.
5. Nickel-Copper Alloy: 0.005 inch thick.

C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.

D. Weld-Attached Anchor Pins and Washers: Copper-coated steel pin for capacitor-discharge welding and galvanized speed washer. Pin length sufficient for insulation thickness indicated.

1. Welded Pin Holding Capacity: 100 lb for direct pull perpendicular to the attached surface.

E. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts, plenums, and breechings; and to achieve a holding capacity of 100 lb for direct pull perpendicular to the adhered surface.

F. Self-Adhesive Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

2.5 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

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.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of equipment.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each equipment system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either the wet or dry state.

D. Apply multiple layers of insulation with longitudinal and end seams staggered.

E. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

F. Keep insulation materials dry during application and finishing.

G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

H. Apply insulation with the least number of joints practical.

I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.

K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

L. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.
2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges and fittings.

M. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.

N. Install vapor-retarder mastic on equipment scheduled to receive vapor retarders. Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.

O. Insulate the following indoor equipment:

1. Heating hot-water air separators (small tanks).
2. Heating hot-water compression tanks (small tanks).
3. Any equipment surface that will consistently operate below the dew point of the space in which it is located if such equipment is not factory insulated.

P. Omit insulation from the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 EQUIPMENT, TANK, AND VESSEL INSULATION APPLICATION

A. Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of tank and vessel surfaces.
2. Groove and score insulation materials to fit as closely as possible to the equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joint. Stagger end joints.
3. Protect exposed corners with secured corner angles.
4. Install adhesive-attached or self-adhesive anchor pins and speed washers on sides of tanks and vessels as follows:

    a. Do not weld anchor pins to ASME-labeled pressure vessels.

b. On tank and vessel, 3 inches maximum from insulation end joints, and 16 inches o.c. in both directions.
c. Do not overcompress insulation during installation.
d. Cut and miter insulation segments to fit curved sides and dome heads of tanks and vessels.

5. Impale insulation over anchor pins and attach speed washers.
6. 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
7. Secure each layer of insulation with stainless-steel bands.
8. Stagger joints between insulation layers at least 3 inches.
9. Apply insulation in removable segments on equipment access doors and other elements that require frequent removal for service.
10. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
11. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

3.5 FIELD-APPLIED JACKET APPLICATION

A. Apply glass-cloth jacket where indicated, directly over bare insulation or insulation with factory-applied jackets.

1. Apply jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch thick coats of jacket manufacturer's recommended adhesive.
3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

B. Foil and Paper Jackets: Apply foil and paper jackets where indicated.

1. Draw jacket material smooth and tight.
2. Apply lap or joint strips with the same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Apply jackets with 1-1/2-inch laps at longitudinal seams and 3-inch wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-retarder mastic.

C. PVC Jackets: Apply jacket with longitudinal seams along top and bottom of tanks and vessels for horizontal applications. Secure and seal seams and end joints with manufacturer's welding adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along the seam and joint edge.

D. Aluminum Jackets: Secure jackets according to jacket manufacturer's written instructions.

3.6 FINISHES

A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

3.7 FIELD QUALITY CONTROL

A. Insulation applications will be considered defective if sample inspection reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.

B. Reinstall insulation and covers on pumps and tanks uncovered for inspection according to these Specifications.

3.8 EQUIPMENT APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.

3.9 INTERIOR TANK AND VESSEL INSULATION APPLICATION SCHEDULE

A. Equipment: Heating hot-water air separators and compression tanks.

1. Operating Temperature: 100 to 200 deg F.
2. Insulation Material: Mineral fiber.
3. Insulation Thickness: 1-1/2 inch
4. Field-Applied Jacket: PVC.

5. Vapor Retarder Required: No.
6. Finish: None.
7. Conductivity (k-value): 0.24 (btu-in / hr-sq ft-deg F) @ 75 degrees F.

END OF SECTION 230702

SECTION 230703 - HVAC PIPE INSULATION

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 preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

B. Related Sections include the following:

1. Section "Firestopping" for firestopping materials and requirements for penetrations through fire and smoke barriers.
2. Section "Equipment Insulation" for insulation materials and application for pumps, tanks, hydronic specialties, and other equipment.
3. Section "Hangers and Supports" for pipe insulation shields and protection saddles.

1.3 SUBMITTALS

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

B. LEED Submittal:

1. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content.

C. Shop Drawings: Show fabrication and installation details for the following:

1. Application of protective shields, saddles, and inserts at pipe hangers for each type of insulation and hanger.
2. Attachment and covering of heat trace inside insulation.
3. Insulation application at pipe expansion joints for each type of insulation.
4. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Removable insulation at piping specialties and equipment connections.
6. Application of field-applied jackets.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.

E. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Qualified, authorized, and trained by manufacturer to install manufacturer's products, and who has completed installations similar in design, scope and scale to those indicated for this Project.
2. Certified by Insulation Contractors Association of America as a Commercial Building Insulation Contractor in good standing.
3. Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.

B. Insulation Materials: Insulation materials manufacturing facilities must be certified and registered with an approved registrar for conformance with ISO 9000 Quality Standard.

C. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Section "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for insulation application.

C. Coordinate installation and testing of steam or electric heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after testing piping systems and, where required, after installing and testing heat-trace tape. Insulation application may begin on segments of piping that have satisfactory test results.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mineral-Fiber Insulation:

a. Johns Manville Corp.
b. Knauf FiberGlass.
c. Owens-Corning Fiberglas Corp.

2. Flexible Elastomeric Thermal Insulation:

a. Armacell LLT.
b. Rubatex Corp.

3. PVC Jackets and Fittings:

a. Zeston 2000.
b. Ceel-Co.
c. Proto

2.2 INSULATION MATERIALS

A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:

1. Preform Pipe Insulation: Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL (all service jacket-self sealing laps).
2. Blanket Insulation: Comply with ASTM C 553, Type II, without facing.
3. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:

a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.
b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.

4. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
5. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
6. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.
7. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

B. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Adhesive: As recommended by insulation material manufacturer.
2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.

2.3 FIELD-APPLIED JACKETS

A. General: ASTM C 921, Type 1, unless otherwise indicated.

B. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

C. PVC Jacket: High-impact, ultraviolet-resistant PVC; 20 mils thick; roll stock ready for shop or field cutting and forming.

1. Adhesive: As recommended by insulation material manufacturer.
2. PVC Jacket Color: White.

D. Heavy PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 30-mil thick, high-impact, ultraviolet-resistant PVC.

1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
2. Adhesive: As recommended by insulation material manufacturer.

E. Standard PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil thick, high-impact, ultraviolet-resistant PVC.

1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
2. Adhesive: As recommended by insulation material manufacturer.

F. Aluminum Jacket: Factory cut and rolled to indicated sizes. Comply with ASTM B 209, 3003 alloy, H-14 temper.

G. Aluminum Jacket: Aluminum roll stock, ready for shop or field cutting and forming to indicated sizes. Comply with ASTM B 209, 3003 alloy, H-14 temper.

1. Finish and Thickness: Smooth/embossed finish, 0.016 inch thick.
2. Moisture Barrier: 1-mil thick, heat-bonded polyethylene and kraft paper.
3. Elbows: Preformed, 45- and 90-degree, short- and long-radius elbows; same material, finish, and thickness as jacket.
4. .

2.4 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd.

1. Tape Width: 4 inches.

B. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:

1. Stainless Steel: ASTM A 666, Type 304; 0.020 inch thick.
2. Galvanized Steel: 0.005 inch thick.
3. Aluminum: 0.007 inch thick.
4. Brass: 0.010 inch thick.
5. Nickel-Copper Alloy: 0.005 inch thick.

C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.

2.5 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

B. Factory/ field applied PVDC vapor barrier film and tape as recommended by insulation manufacturer.

1. Permeance of vapor barrier film will be less than 0.02 perms for applications above 32 degrees F and less than 0.01 perm for applications below 32 degrees F. When service temperature is above ambient, vapor retarder is not required.
2. Permeance of vapor barrier tape will be less than 0.03 perms for applications above 32 degrees F and less than 0.02 perms for applications below 32 degrees F. When service temperature is above ambient, vapor retarder is not required.

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.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.

E. Apply multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

H. Keep insulation materials dry during application and finishing.

I. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

J. Apply insulation with the least number of joints practical.

K. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

L. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.

1. Apply insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
3. Install insert materials and apply insulation to tightly join the insert. Seal insulation-to-insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.
5. Provide insert between support shield and piping ¾" diameter or larger. Fabricate from hydrous calcium silicate (Johns Manville Thermo-12) or other heavy density insulating material suitable for temperature. Insulation inserts shall be not less than the following lengths:

3/4 inch to 2.5 inch pipe size:	10 inch long
3 inch to 6 inch pipe size:	12 inch long
8 inch to 10 inch pipe size:	16 inch long
12 inch and over:	22 inch long

M. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

N. Apply adhesives and mastics at the manufacturer's recommended coverage rate.

O. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.
2. Circumferential Joints: Cover with 3 inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches o.c.
3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.

4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.

P. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

1. Seal penetrations with vapor-retarder mastic.

2. Apply insulation for exterior applications tightly joined to interior insulation ends.
3. Extend metal jacket of exterior insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal metal jacket to roof flashing with vapor-retarder mastic.

Q. Exterior Wall Penetrations: For penetrations of below-grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retarder mastic.

R. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.

S. Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions.

1. Firestopping and fire-resistive joint sealers are specified in Section "Firestopping."

T. Floor Penetrations: Apply insulation continuously through floor assembly.

1. For insulation with vapor retarders, seal insulation with vapor-retarder mastic where floor supports penetrate vapor retarder.

3.4 MINERAL-FIBER INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet to form a vapor retarder between pipe insulation segments.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with standard PVC fitting covers.
4. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded insulation sections are not available, apply glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to strainer basket without disturbing insulation.
3. Apply insulation to flanges as specified for flange insulation application.
4. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
5. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
6. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.5 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Follow manufacturer's written instructions for applying insulation.
2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

B. Apply insulation to flanges as follows:

1. Apply pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the 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 the same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

C. Apply insulation to fittings and elbows as follows:

1. Apply mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

D. Apply insulation to valves and specialties as follows:

1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.
2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, fabricate removable sections of insulation arranged to allow access to strainer basket.
3. Apply insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.6 FIELD-APPLIED JACKET APPLICATION

A. Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.

1. Apply jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch thick coats of jacket manufacturer's recommended adhesive.
3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

B. Foil and Paper Jackets: Apply foil and paper jackets where indicated.

1. Draw jacket material smooth and tight.
2. Apply lap or joint strips with the same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Apply jackets with 1-1/2-inch laps at longitudinal seams and 3-inch wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-retarder mastic.

C. Apply PVC jacket where indicated, with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

D. Apply metal jacket where indicated, with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.7 FINISHES

A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of the insulation manufacturer's recommended protective coating.

3.8 PIPING SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

1. Flexible connectors.
2. Vibration-control devices.
3. Fire-suppression piping.
4. Drainage piping located in crawl spaces, unless otherwise indicated.
5. Below-grade piping, unless otherwise indicated.
6. Chrome-plated pipes and fittings, unless potential for personnel injury.
7. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.9 FIELD QUALITY CONTROL

A. Insulation applications will be considered defective if sample inspection reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.

B. Reinstall insulation and covers on fittings and valves uncovered for inspection according to these Specifications.

3.10 INSULATION APPLICATION SCHEDULE, GENERAL

A. Refer to insulation application schedules for required insulation materials, vapor retarders, and field-applied jackets.

B. Application schedules identify piping system and indicate pipe size ranges and material, thickness, and jacket requirements.

3.11 INTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Condensate drain piping.

1. Operating Temperature: 35 to 75 deg F.
2. Insulation Material: Mineral fiber.
3. Insulation Thickness: 1 inch thickness
4. Field-Applied Jacket: None.

5. Vapor Retarder Required: Yes.
6. Finish: None.
7. Conductivity (k-value): 0.23 (btu-in / hr-sq ft-deg F) @ 75 degrees F. mean temperature.

B. Service: Refrigerant liquid, suction, and hot-gas piping.

1. Operating Temperature: 40 to 120 deg F.
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: Apply the following insulation thicknesses:

    a. Copper Pipe, all pipe sizes: 0.5 inch insulation thickness

4. Field-Applied Jacket (concealed pipe): none.
5. Field-Applied Jacket (exposed pipe):

    a. For all exposed finished spaces and areas subject to abuse:

        1) Minimum 30-mil Zeston 2000 PVC (Color to be selected by the architect. White is standard).
        2) Minimum 0.024-inch aluminum (Color/finish to be selected by the architect. White, gray and clear-coated are standard. Mill finish is unpainted).

6. Vapor Retarder Required: No, not required for elastomeric insulation.
7. Finish: Armacell WB Armaflex finish or equal. Composed of pigmented acrylic latex.
8. Conductivity (k-value): 0.27 (btu-in / hr-sq ft-deg F) @ 75 degrees F. mean temperature.

3.12 EXTERIOR INSULATION APPLICATION SCHEDULE

A. This application schedule is for aboveground insulation outside the building. Loose-fill insulation, for belowground piping, is specified in Division 2 piping distribution Sections.

B. Service: Refrigerant suction, liquid, and hot gas bypass.

1. Operating Temperature: 35 to 120 deg F.
2. Insulation Material: Flexible elastomeric (Armacell AP Armaflex or equal).
3. Insulation Thickness: Apply the following insulation thicknesses:

    a. Copper pipe, all pipe sizes: 1 inch insulation thickness

4. Field-Applied Jacket: Minimum 30 mil Aluminum.
5. Vapor Retarder Required: No, not for elastomeric insulation.
6. Finish: None for insulation with jacketing.
7. Finish: Two coats of WB Armaflex finish, a water-based latex enamel.

    a. Application: The contractor shall install the finish according to the latest manufacturer’s recommendations and installation instructions.

b. Finish may be applied over Armaflex 520 adhesive joints after the adhesive has been allowed to set for one hour.
c. Stir thoroughly and apply with a brush or roller to clean, dry, oil-free surfaces only at temperatures above 50 degrees F. Prior to applying finish, the insulation surface shall be wiped with a damp cloth, dampened with a non-oily solvent such as alcohol to remove any traces of powdered lubricant.
d. Apply with a brush or roller. A two-coat application is required. Allow the first coat to dry before applying the second coat. Drying time is minimum 4 hours before applying a second coat. Finish may be applied with short-nap paint roller. Coverage is approximately 400 square feet per gallon in single brush coat, depending on temperature and location.

8. Conductivity (k-value): 0.27 (btu-in / hr-sq ft-deg F) @ 75 degrees F. mean temperature.

END OF SECTION 230703

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

1.4 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:

1. Thermostatic expansion valves.
2. Solenoid valves.
3. Hot-gas bypass valves.
4. Filter dryers.
5. Strainers.
6. Pressure-regulating valves.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

1. Shop Drawing Scale: 1/4 inch equals 1 foot.
2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between

compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.7 COORDINATION

A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

2.2 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

C. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

D. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat Disc: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240 deg F.

E. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.

5. Suction Temperature: 40 deg F.
6. Superheat: Adjustable.
7. Reverse-flow option (for heat-pump applications).
8. End Connections: Socket, flare, or threaded union.
9. Working Pressure Rating: 700 psig.

F. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.
2. Screen: 100-mesh stainless steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig.
5. Maximum Operating Temperature: 275 deg F.

G. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 deg F.

H. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 240 deg F.

I. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

2.3 REFRIGERANTS

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. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.

B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, or drawn-temper tubing and wrought-copper fittings with brazed joints.

C. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

E. Install a full-sized, three-valve bypass around filter dryers.

F. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

G. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

H. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

I. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

J. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operation" for control wiring and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

R. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."

S. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

T. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

U. Seal pipe penetrations through exterior walls according to Division 07 Section "Joint Sealants" for materials and methods.

V. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."

3.4 PIPE JOINT CONSTRUCTION

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

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Spring hangers to support vertical runs.
3. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.

D. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

a. Fill system with nitrogen to the required test pressure.
b. System shall maintain test pressure at the manifold gage throughout duration of test.

c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

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. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. LEED Submittals:

1. Product Data for Prerequisite EQ 1: Documentation indicating that duct systems comply with ASHRAE 62.1-2007, Section 5 - "Systems and Equipment."
2. Product Data for Prerequisite EA 2: Documentation indicating that duct systems comply with ASHRAE/IESNA 90.1-2007, Section 6.4.4 - "HVAC System Construction and Insulation."
3. Leakage Test Report for Prerequisite EA 2: Documentation of work performed for compliance with ASHRAE/IESNA 90.1-2007, Section 6.4.4.2.2 - "Duct Leakage Tests."
4. Duct-Cleaning Test Report for Prerequisite EQ 1: Documentation of work performed for compliance with ASHRAE 62.1-2007, Section 7.2.4 - "Ventilation System Start-Up."
5. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content.

C. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

D. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

E. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.

F. Welding certificates.

G. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2016, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2016, 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 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 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, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Lindab Inc.
    b. McGill AirFlow LLC.
    c. SEMCO Incorporated.
    d. Sheet Metal Connectors, Inc.
    e. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," 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. Spiral Lockseam: formed from a coil of metal into a rigid steel tube with a 4-ply spiral lockseam. Fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," 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."

E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. 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.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

1. rivets, or welds.

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
9. VOC: Maximum 395 g/L.
10. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
11. Service: Indoor or outdoor.
12. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

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

F. Round Duct Joint O-Ring Seals:

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

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

D. 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.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. 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, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

    a. Ducts with a Pressure Class of 2-Inch wg Higher: Test representative duct sections totaling no less than 50 percent of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

    a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.8 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.9 DUCT SCHEDULE

A. Supply Ducts:

1. Ducts Connected to HVAC Equipment:

a. Pressure Class: Positive 2-inch wg and below.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to HVAC Equipment:
a. Pressure Class: Positive 2-inch wg and above.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.
e.

B. Return Ducts:

1. Ducts Connected to HVAC Equipment:

a. Pressure Class: Positive 2-inch wg and below.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to HVAC Equipment:
a. Pressure Class: Positive 2-inch wg and above.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
a. Pressure Class: Positive 2-inch wg and below.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

D. Liner:

1. Supply Air Ducts: Fibrous glass, Type I, 1 inch thick.
2. Return Air Ducts: Fibrous glass, Type I thick.

E. Elbow Configuration:

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

a. Velocity 1000 fpm or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.

2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

c. Velocity 1500 fpm or Higher:

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

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

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. 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 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

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

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

F. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

    a. Rectangular Main to Rectangular Branch: 45-degree entry.
    b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.

    a. Velocity 1000 fpm or Lower: 90-degree tap.
    b. Velocity 1000 to 1500 fpm: Conical tap.
    c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Centrifugal roof ventilators.
2. Ceiling-mounting ventilators.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on sea level.

B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.
2. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

C. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Roof framing and support members relative to duct penetrations.
2. Ceiling suspension assembly members.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set(s) for each belt-driven unit.

PART 2 - PRODUCTS

2.1 CEILING-MOUNTING VENTILATORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Greenheck.
2. Loren Cook Company.
3. Penn Barry.
4. Acme
5. Carnes

B. Description: Centrifugal fans designed for installing in ceiling or wall or for concealed in-line applications.

C. Housing: Steel, lined with acoustical insulation.

D. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

E. Grille: Painted aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.

F. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

G. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
3. Isolation: Rubber-in-shear vibration isolators.

2.2 MOTORS

A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

B. Enclosure Type: Totally enclosed, fan cooled.

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 power ventilators level and plumb.

B. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 07 Section "Roof Accessories" for installation of roof curbs.

C. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

D. Support suspended units from structure using threaded steel rods and elastomeric hangers.

E. Install units with clearances for service and maintenance.

F. Label units 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 power ventilators 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."

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. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION 233423

SECTION 236200 - PACKAGED COMPRESSOR AND CONDENSER UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes packaged, refrigerant compressor and condenser units.

1.3 ACTION SUBMITTALS

A. Product Data: For each compressor and condenser unit. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include equipment dimensions, weights and structural loads, required clearances, method of field assembly, components, and location and size of each field connection.

B. Shop Drawings: For compressor and condenser units. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members to which compressor and condenser units will be attached.
2. Liquid and vapor pipe sizes.
3. Refrigerant specialties.
4. Piping including connections, oil traps, and double risers.
5. Compressors.
6. Evaporators.

B. Field quality-control reports.

C. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For compressor and condenser units to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Fabricate and label refrigeration system according to ASHRAE 15, "Safety Standard for Refrigeration Systems."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6, "Heating, Ventilating, and Air-Conditioning."

D. ASME Compliance: Fabricate and label water-cooled compressor and condenser units to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-In-Place Concrete" and Section 033053 "Miscellaneous Cast-In-Place Concrete."

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

C. Coordinate location of piping and electrical rough-ins.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of compressor and condenser units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Compressor failure.
    b. Condenser coil leak.
2. Warranty Period (Compressor Only): Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 COMPRESSOR AND CONDENSER UNITS, AIR COOLED, 1 TO 5 TONS

A. Description: Factory assembled and tested; consisting of compressor, condenser coil, fan, motors, refrigerant reservoir, and operating controls.

B. Compressor: Scroll, hermetically sealed, with rubber vibration isolators.

1. Motor: Two speed, and includes thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
2. Two-Speed Compressor: Include manual-reset, high-pressure switch and automatic-reset, low-pressure switch.

C. Refrigerant: R-410A.

D. Condenser Coil: Seamless copper-tube, aluminum-fin coil; circuited for integral liquid subcooler, with removable drain pan and brass service valves with service ports.

E. Condenser Fan: Direct-drive, aluminum propeller fan; with permanently lubricated, totally enclosed fan motor with thermal-overload protection.

F. Accessories:
1. Crankcase heater.
2. Cycle Protector: Automatic-reset timer to prevent rapid compressor cycling.
3. High-Pressure Switch: Automatic-reset switch cycles compressor off on high refrigerant pressure.
4. Low-Ambient Controller: Cycles condenser fan to permit operation down to 30 deg F.
5. Low-Pressure Switch: Automatic-reset switch cycles compressor off on low refrigerant pressure.
6. Thermostatic expansion valve.

G. Unit Casing: Galvanized steel, finished with baked enamel; with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Mount service valves, fittings, and gage ports on exterior of casing.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate compressor and condenser units according to ARI 206/110.

B. Energy Efficiency: Equal to or greater than prescribed by ASHRAE/IESNA 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," Section 6, "Heating, Ventilating, and Air-Conditioning."

C. Test and inspect shell and tube condensers according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. Testing Requirements: Factory test sound-power-level ratings according to ARI 270.

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 compressor and condenser units.

B. Examine roughing-in for refrigerant piping systems to verify actual locations of piping connections before equipment installation.

C. Examine walls, floors, and roofs for suitable conditions where compressor and condenser units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units level and plumb, firmly anchored in locations indicated.

B. Install roof-mounting units on equipment supports specified in Section 077200 "Roof Accessories."

C. Maintain manufacturer's recommended clearances for service and maintenance.

D. Loose Components: Install electrical components, devices, and accessories that are not factory mounted.

3.3 CONNECTIONS

A. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

B. Connect refrigerant piping to air-cooled compressor and condenser units; maintain required access to unit. Install furnished field-mounted accessories. Refrigerant piping and specialties are specified in Section 232300 "Refrigerant Piping."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.
2. Leak Test: After installation, charge system with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor operation and unit operation, product capability, and compliance with requirements.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
5. Verify proper airflow over coils.

C. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

D. Compressor and condenser units will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 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 and perform the following:

a. Inspect for physical damage to unit casing.
b. Verify that access doors move freely and are weathertight.
c. Clean units and inspect for construction debris.
d. Verify that all bolts and screws are tight.
e. Verify that controls are connected and operational.

B. Lubricate bearings on fan motors.

C. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.

D. Adjust fan belts to proper alignment and tension.

E. Start unit according to manufacturer's written instructions and complete manufacturer's startup checklist.

F. Measure and record airflow and air temperature rise over coils.

G. Verify proper operation of condenser capacity control device.

H. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

I. After startup and performance test, lubricate bearings.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain compressor and condenser units.

END OF SECTION 236200

SECTION 238129 - VARIABLE-REFRIGERANT-FLOW HVAC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes complete VRF HVAC system(s) including, but not limited to, delegated design and the following components to make a complete operating system(s) according to requirements indicated:
   1. Indoor, Indoor, recessed, ceiling-mounted units.
   2. Outdoor, air-source, heat-pump units.
   3. System controls.
   4. System refrigerant and oil.
   5. System condensate drain piping.
   6. System refrigerant piping.
   7. Metal hangers and supports.
   8. Metal framing systems.
   9. Fastener systems.
   10. Pipe stands.
   11. Miscellaneous support materials.
   12. Piping and tubing insulation.
   13. System control cable and raceways.

1.3 DEFINITIONS

A. Air-Conditioning System Operation: System capable of operation with all zones in cooling only.

B. Heat-Pump System Operation: System capable of operation with all zones in either heating or cooling, but not with simultaneous heating and cooling zones that transfer heat between zones.

C. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

D. Plenum: A space forming part of the air distribution system to which one or more air ducts are connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.

E. Two-Pipe System Design: One refrigerant vapor line and one refrigerant liquid line connect a single outdoor unit or multiple manifold outdoor units in a single system to associated system HRCUs. One refrigerant liquid line and refrigerant vapor line connect HRCUs to associated indoor units. HRCUs

used in two pipe systems act as an intermediate heat exchanger and include diverting valves and gas/liquid separators to move high and low-pressure refrigerant between indoor units.

F. VRF: Variable refrigerant flow.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for indoor and outdoor units.

2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

3. Include operating performance at design conditions and at extreme maximum and minimum outdoor ambient conditions.

4. Include description of system controllers, dimensions, features, control interfaces and connections, power requirements, and connections.

5. Include system operating sequence of operation in narrative form for each unique indoor- and outdoor-unit control.

6. Include description of control software features.

7. Include total refrigerant required and a comprehensive breakdown of refrigerant required by each system installed.

8. Include refrigerant type and data sheets showing compliance with requirements indicated.

9. For system design software.

10. Indicate location and type of service access.

B. Sustainable Design Submittals:

1. Product Data for EA Prerequisite "Minimum Energy Performance": Indicating compliance with minimum energy performance requirements.

2. ASHRAE 62.1 Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

3. ASHRAE/IES 90.1 compliance.

4. Air-Balance Report: Documentation indicating that Work complies with ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

5. Product Data for EA Prerequisite "Fundamental Refrigerant Management": For refrigerants, indicating compliance with refrigerant management practices.

6. Product Data for EA Credit "Optimize Energy Performance": Indicating that system meets efficiency requirements.

7. Product Data for EA Credit "Enhanced Refrigerant Management": Indicating that products meet requirements for refrigerant management.

8. Product Data for EA Credit "Advanced Energy Metering": For continuous metering equipment.

9. Product Data for EQ Credit "Acoustic Performance": Documentation indicating that systems and equipment comply.

10. Product Data for EQ Credit "Thermal Comfort": Documentation indicating that systems, equipment, and controls comply.

C. Shop Drawings: For VRF HVAC systems.

1. Include plans, elevations, sections, and mounting details.

2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

3. Include diagrams and details of refrigerant piping and tubing showing installation requirements for manufacturer-furnished divided flow fittings.

4. Include diagrams for power, signal, and control wiring.

D. Delegated-Design Submittals:

1. Include design calculations for selecting vibration isolators and for designing vibration isolation bases.

2. Include design calculations with corresponding diagram of refrigerant piping and tubing sizing for each system installed.

3. Include design calculations with corresponding floor plans indicating that refrigerant concentration limits are within allowable limits of ASHRAE 15 and governing codes.

4. Include calculations showing that system travel distance for refrigerant piping and controls cabling are within horizontal and vertical travel distances set by manufacturer. Provide a comparison table for each system installed.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, elevations, sections, and details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.

2. Structural floors, roofs and associated members to which equipment, piping, cables, and conduit will be attached.

3. Size and location of initial access modules for acoustical tile.

4. Wall-mounted controllers located in finished space showing relationship to light switches, fire-alarm devices, and other installed devices.

5. Size and location of access doors and panels installed behind walls and inaccessible ceilings for products installed behind walls and requiring access.

6. Items penetrating finished ceiling including the following:
   a. Luminaires.
   b. Air outlets and inlets.
   c. Speakers.
   d. Sprinklers.
   e. Service access panels.

B. Qualification Data:

1. For Installer: Certificate from VRF HVAC system manufacturer certifying that Installer has successfully completed prerequisite training administered by manufacturer for proper installation of systems, including but not limited to, equipment, piping, controls, and accessories indicated and furnished for installation.
   a. Retain copies of Installer certificates on-site and make available on request.

2. For VRF HVAC system manufacturer.

3. For VRF HVAC system provider.

C. Product Certificates: For each type of product.

D. Product Test Reports: Where tests are required, for each product, for tests performed by a qualified testing agency.

E. Source quality-control reports.

F. Field quality-control reports.

G. Sample Warranties: For manufacturer's warranties.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For VRF HVAC systems to include in emergency, operation, and maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.

2. Program Software Backup: On CD or DVD, USB media, or approved cloud storage platform, complete with data files.

3. Device address list.

4. Printout of software application and graphic screens.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Nationally recognized manufacturer of VRF HVAC systems and products.

2. Shipped VRF HVAC systems with similar requirements to those indicated for a continuous period of five years within time of bid.

3. VRF HVAC systems and products that have been successfully tested and in use on at least three completed projects.

4. Having complete published catalog literature, installation, and operation and maintenance manuals for all products intended for use.

5. Having full-time in-house employees for the following:
   a. Product research and development.
   b. Product and application engineering.
   c. Product manufacturing, testing, and quality control.
   d. Technical support for system installation training, startup, commissioning, and troubleshooting of installations.
   e. Owner training.

B. Factory-Authorized Service Representative Qualifications:

1. Authorized representative of, and trained by, VRF HVAC system manufacturer.

2. Demonstrated past experience with products being installed for period within three consecutive years before time of bid.

3. Demonstrated past experience on five projects of similar complexity, scope, and value.
   a. Each person assigned to Project shall have demonstrated past experience.

4. Staffing resources of competent and experienced full-time employees that are assigned to execute work according to schedule.

5. Service and maintenance staff assigned to support Project during warranty period.

6. Product parts inventory to support ongoing system operation for a period of not less than five years after Substantial Completion.

7. VRF HVAC system manufacturer's backing to take over execution of Work if necessary to comply with requirements indicated. Include Project-specific written letter, signed by manufacturer's corporate officer, if requested.

C. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by VRF HVAC system manufacturer.

1. Each employee shall be certified by manufacturer for proper installation of systems, including, but not limited to, equipment, piping, controls, and accessories indicated and furnished for installation.

2. Installer certification shall be valid and current for duration of Project.

3. Retain copies of Installer certificates on-site and make available on request.

4. Each person assigned to Project shall have demonstrated past experience.
   a. Demonstrated past experience with products being installed for period within three consecutive years before time of bid.
   b. Demonstrated past experience on five projects of similar complexity, scope, and value.

5. Installers shall have staffing resources of competent, trained, and experienced full-time employees that are assigned to execute work according to schedule.

D. ISO Compliance: System equipment and components furnished by VRF HVAC system manufacturer shall be manufactured in an ISO 9001 and ISO 14001 facility.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in a clean and dry place.

B. Comply with manufacturer's written rigging and installation instructions for unloading and moving to final installed location.

C. Handle products carefully to prevent damage, breaking, denting, and scoring. Do not install damaged products.

D. Protect products from weather, dirt, dust, water, construction debris, and physical damage.

1. Retain factory-applied coverings on equipment to protect finishes during construction and remove just prior to operating unit.

2. Cover unit openings before installation to prevent dirt and dust from entering inside of units. If required to remover coverings during unit installation, reapply coverings over openings after unit installation and remove just prior to operating unit.

E. Replace installed products damaged during construction.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace equipment and components that fail(s) in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures.
   b. Faulty operation.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period:
   a. For Compressor: Five year(s) from date of Substantial Completion.
   b. For Parts, Including Controls: One year(s) from date of Substantial Completion.
   c. For Labor: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Daikin
   2. Mitsubishi
   3. Trane

B. Source Limitations: Obtain products from single source from single manufacturer including, but not limited to, the following:
   1. Indoor and outdoor units, including accessories.
   2. Controls and software.
   3. Refrigerant isolation valves.
   4. Specialty refrigerant pipe fittings.

2.2 SYSTEM DESCRIPTION

A. Direct-expansion (DX) VRF HVAC system(s) with variable capacity in response to varying cooling and heating loads. System shall consist of multiple indoor units, outdoor unit(s), piping, controls, and electrical power to make complete operating system(s) complying with requirements indicated.
   1. Two-pipe system design.
   2. System(s) operation, heat pump as indicated on Drawings.
   3. Each system with one refrigerant circuit shared by all indoor units connected to system.

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. AHRI Compliance: System and equipment performance certified according to AHRI 1230 and products listed in AHRI directory.

D. ASHRAE Compliance:

1. ASHRAE 15: For safety code for mechanical refrigeration.

2. ASHRAE 62.1: For indoor air quality.

3. ASHRAE 135: For control network protocol with remote communication.

4. ASHRAE/IES 90.1 Compliance: For system and component energy efficiency.

E. UL Compliance: Comply with UL 1995.

2.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional specialist, as defined in Section 01 40 00 "Quality Requirements," to design complete and operational VRF HVAC system(s) complying with requirements indicated.

1. Provide system refrigerant calculations.
   a. Refrigerant concentration limits shall be within allowable limits of ASHRAE 15 and governing codes.
   b. Indicate compliance with manufacturer's maximum vertical and horizontal travel distances. Prepare a comparison table for each system showing calculated distances compared to manufacturer's maximum allowed distances.

2. System Refrigerant Piping and Tubing:
   a. Arrangement: Arrange piping to interconnect indoor units and outdoor unit(s) in compliance with manufacturer requirements and requirements indicated.
   b. Routing: Conceal piping above ceilings and behind walls to maximum extent possible.
   c. Sizing: Size piping system, using a software program acceptable to manufacturer, to provide performance requirements indicated. Consider requirements to accommodate future change requirements.

3. System Controls:
   a. Network arrangement.
   b. Network interface with other building systems.
   c. Product selection.
   d. Sizing.

B. Service Access:

1. Provide and document service access requirements.

2. Locate equipment, system isolation valves, and other system components that require service and inspection in easily accessible locations. Avoid locations that are difficult to access if possible.

3. Where serviceable components are installed behind walls and above inaccessible ceilings, provide finished assembly with access doors or panels to gain access. Properly size the openings to allow for service, removal, and replacement.

4. If less than full and unrestricted access is provided, locate components within an 18-inch reach of the finished assembly.

5. Where ladder access is required to service elevated components, provide an installation that provides for sufficient access within ladder manufacturer's written instructions for use.

6. Comply with OSHA regulations.

C. System Design and Installation Requirements:

1. Design and install systems indicated according to manufacturer's recommendations and written instructions.

2. Where manufacturer's requirements differ from requirements indicated, contact Architect for direction. The most stringent requirements should apply unless otherwise directed in writing by Architect.

D. Isolation of Equipment: Provide isolation valves to isolate each indoor unit and outdoor unit for service, removal, and replacement without interrupting system operation.

E. System Turndown: Stable operation down to 20 percent of outdoor-unit capacity.

F. System Auto Refrigerant Charge: Each system shall have an automatic refrigerant charge function to ensure the proper amount of refrigerant is installed in system.

G. Outdoor Conditions:

1. Suitable for outdoor ambient conditions encountered.
   a. Design equipment and supports to withstand wind loads of governing code.

H. Sound Performance: Sound levels generated by operating HVAC equipment shall be within requirements indicated.

1. Indoor: Within design guidelines of "2015 ASHRAE HANDBOOK- HVAC Applications."

2. Outdoor: Within ordinance of governing authorities.

I. Thermal Movements: Allow for controlled thermal movements from ambient, surface, and system temperature changes.

J. Capacities and Characteristics: As indicated on Drawings.

2.4 INDOOR, CONCEALED, FLOOR-MOUNTED UNITS FOR DUCTING

A. Description: Factory-assembled and -tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

1. Material: Galvanized steel.

2. Insulation: Manufacturer's standard internal insulation, complying with ASHRAE 62.1, to provide thermal resistance and prevent condensation.

3. Duct Connections: Extended collar or flange, or designated exterior cabinet surface, designed for attaching field-installed ductwork.

4. Mounting: Manufacturer-designed provisions for field installation.

5. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.

2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.

3. Coil Tubes: Copper, of diameter and thickness required by performance.

4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.

5. Unit Internal Tubing: Copper tubing with brazed joints.

6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.

7. Field Piping Connections: Manufacturer's standard.

8. Factory Charge: Dehydrated air or nitrogen.

9. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.

2. Condensate Removal: Unit-mounted pump or other integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.

3. Field Piping Connection: Non-ferrous material.

E. Fan and Motor Assembly:

1. Fan(s):
   a. Direct-drive arrangement.
   b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
   c. Materials: Non-ferrous components or ferrous components with corrosion resistant finish.
   d. Statically and dynamically balanced.

2. Motor: Brushless dc or electronically commutated with permanently lubricated bearings.

3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.

4. Speed Settings and Control: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.

5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Bottom, side, or rear to accommodate field installation without removing ductwork and to accommodate filter replacement without need for tools.

2. Efficiency: ASHRAE 52.2, MERV 7.

3. Media:
   a. Washable: Manufacturer's standard filter with antimicrobial treatment.

G. Unit Accessories:

1. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.

H. Unit Controls:

1. Enclosure: Metal, suitable for indoor locations.

2. Factory-Installed Controller: Configurable digital control.

3. Factory-Installed Sensors:
   a. Unit inlet air temperature.
   b. Coil entering refrigerant temperature.
   c. Coil leaving refrigerant temperature.

4. Features and Functions:
   a. Self-diagnostics.
   b. Time delay, auto-restart.
   c. External static pressure control.
   d. Auto operation mode.
   e. Manual operation mode.
   f. Filter service notification.

g. Power consumption display.
h. Drain assembly high water level safety shutdown and notification.
i. Run test switch.

5. Communication: Network communication with other indoor units and outdoor unit(s).

6. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

7. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

I. Unit Electrical:

1. Enclosure: Metal, similar to enclosure, and suitable for indoor locations.

2. Field Connection: Single point connection to power unit and integral controls.

3. Disconnecting Means: Factory-mounted circuit breaker or switch.

4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.

5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

6. Raceways: Enclose line voltage wiring in metal raceways.

2.5 INDOOR, EXPOSED, WALL-MOUNTED UNITS

A. Description: Factory-assembled and -tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

B. Cabinet:

1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.

2. Insulation: Manufacturer's standard internal insulation, complying with ASHRAE 62.1, to provide thermal resistance and prevent condensation.

3. Mounting: Manufacturer-designed provisions for field installation.

4. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.

2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.

3. Coil Tubes: Copper, of diameter and thickness required by performance.

4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.

5. Unit Internal Tubing: Copper tubing with brazed joints.

6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.

7. Field Piping Connections: Manufacturer's standard.

8. Factory Charge: Dehydrated air or nitrogen.

9. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.

2. Condensate Removal: Gravity.
   a. If a floor drain is not available at unit, provide unit with field-installed condensate pump accessory.

3. Field Piping Connection: Non-ferrous material.

E. Fan and Motor Assembly:

1. Fan(s):
   a. Direct-drive arrangement.
   b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
   c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
   d. Wheels statically and dynamically balanced.

2. Motor: Brushless dc or electronically commutated with permanently lubricated bearings.

3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.

4. Speed Settings and Control: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.

5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Front, to accommodate filter replacement without the need for tools.

2. Washable Media: Manufacturer's standard filter with antimicrobial treatment.

G. Grille Assembly: Manufacturer's standard discharge grille with field-adjustable air pattern mounted in top or front face of unit cabinet.

H. Unit Accessories:

1. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.

2. Condensate Pump: Integral reservoir and control with electrical power connection through unit power.

I. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.

2. Factory-Installed Controller: Configurable digital control.

3. Features and Functions: Self-diagnostics, time delay, auto-restart, auto operation mode, manual operation mode, filter service notification, drain assembly high water level safety shutdown and notification, run test switch.

4. Communication: Network communication with other indoor units and outdoor unit(s).

5. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

6. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

J. Unit Electrical:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.

2. Field Connection: Single point connection to power entire unit and integral controls.

3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.

4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.

5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

6. Raceways: Enclose line voltage wiring in metal raceways to comply with NFPA 70.

2.6 INDOOR, RECESSED, CEILING-MOUNTED UNITS

A. Description: Factory-assembled and -tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.

2. Insulation: Manufacturer's standard internal insulation, complying with ASHRAE 62.1, to provide thermal resistance and prevent condensation.

3. Mounting: Manufacturer-designed provisions for field installation.

4. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.

2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.

3. Coil Tubes: Copper, of diameter and thickness required by performance.

4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.

5. Internal Tubing: Copper tubing with brazed joints.

6. Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.

7. Field Piping Connections: Manufacturer's standard.

8. Factory Charge: Dehydrated air or nitrogen.

9. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.

2. Condensate Removal: Unit-mounted pump or other integral lifting mechanism, capable of lifting drain water to an elevation above top of cabinet.

3. Field Piping Connection: Non-ferrous material.

E. Fan and Motor Assembly:

1. Fan(s):
   a. Direct-drive arrangement.
   b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
   c. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
   d. Wheels statically and dynamically balanced.

2. Motor: Brushless dc or electronically commutated with permanently lubricated bearings.

3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.

4. Speed Settings and Control: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.

5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Bottom, to accommodate filter replacement without the need for tools.

2. Efficiency: ASHRAE 52.2, MERV 7.

3. Media:
   a. Washable: Manufacturer's standard filter with antimicrobial treatment.

G. Discharge-Air Grille Assembly: Mounted in bottom of unit cabinet.

1. Discharge Pattern: One-, two-, three-, or four-way throw as indicated on Drawings.
   a. Discharge Pattern Adjustment: Field-adjustable limits for up and down range of motion.
   b. Discharge Pattern Closure: Ability to close individual discharges of units with multiple patterns.

2. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.

H. Return-Air Grille Assembly: Manufacturer's standard grille mounted in bottom of unit cabinet.

I. Unit Accessories:

1. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.

J. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.

2. Factory-Installed Controller: Configurable digital control.

3. Features and Functions: Self-diagnostics, time delay, auto-restart, auto operation mode, manual operation mode, filter service notification, drain assembly high water level safety shutdown and notification, run test switch.

4. Communication: Network communication with other indoor units and outdoor unit(s).

5. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

6. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

K. Unit Electrical:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.

2. Field Connection: Single point connection to power entire unit and integral controls.

3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.

4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.

5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

6. Raceways: Enclose line voltage wiring in [metal] raceways to comply with NFPA 70.

2.7 OUTDOOR, AIR-SOURCE HEAT-PUMP UNITS

A. Description: Factory-assembled and -tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

1. Specially designed for use in systems with either all heating or all cooling demands, but not for use in systems with simultaneous heating and cooling.

2. Systems shall consist of one unit, or multiple unit modules that are designed by variable refrigerant system manufacturer for field interconnection to make a single refrigeration circuit that connects multiple indoor units.

3. All units installed shall be from the same product development generation.

B. Cabinet:

1. Galvanized steel and coated with a corrosion-resistant finish.
   a. Coating with documented salt spray test performance of 750 hours according ASTM B 117 surface scratch test (SST) procedure.

2. Mounting: Manufacturer-designed provisions for field installation.

3. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. Compressor and Motor Assembly:

1. One or more positive-displacement, direct-drive and hermetically sealed scroll compressor(s) with inverter drive and turndown to 15 percent of rated capacity.

2. Protection: Integral protection against the following:
   a. High refrigerant pressure.
   b. Low oil level.
   c. High oil temperature.
   d. Thermal and overload.
   e. Voltage fluctuations.
   f. Phase failure and phase reversal.
   g. Short cycling.

3. Speed Control: Variable to automatically maintain refrigerant suction and condensing pressures while varying refrigerant flow to satisfy system cooling and heating loads.

4. Vibration Control: Integral isolation to dampen vibration transmission.

5. Oil management system to ensure safe and proper lubrication over entire operating range.

6. Crankcase heaters with integral control to maintain safe operating temperature.

7. Fusible plug.

D. Condenser Coil Assembly:

1. Plate Fin Coils:
   a. Casing: Aluminum, galvanized, or stainless steel.
   b. Fins: Aluminum or copper, mechanically bonded to tubes, with arrangement required by performance.
   c. Tubes: Copper, of diameter and thickness required by performance.

E. Condenser Fan and Motor Assembly:

1. Fan(s): Propeller type.
   a. Direct-drive arrangement.
   b. Fabricated from non-ferrous components or ferrous components with corrosion protection finish to match performance indicated for condenser coil.
   c. Statically and dynamically balanced.

2. Fan Guards: Removable safety guards complying with OSHA regulations. If using metal materials, coat with corrosion-resistant coating to match performance indicated for condenser coil.

3. Motor(s): Brushless dc or electronically commutated with permanently lubricated bearings and rated for outdoor duty.

4. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.

5. Speed Settings and Control: Variable speed with a speed range of least 75 percent.

6. Vibration Control: Integral isolation to dampen vibration transmission.

F. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for unprotected outdoor locations.

2. Factory-Installed Controller: Configurable digital control.

3. Features and Functions: Self-diagnostics, time delay, auto-restart, fuse protection, auto operation mode, manual operation mode, night setback control, run test switch.

4. Communication: Network communication with indoor units and other outdoor unit(s).

5. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

6. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

G. Unit Electrical:

1. Enclosure: Metal, similar to enclosure, and suitable for unprotected outdoor locations.

2. Field Connection: Single point connection to power entire unit and integral controls.

3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.

4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.

5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

6. Raceways: Enclose line voltage wiring in metal raceways to comply with NFPA 70.

H. Unit Hardware: Zinc-plated steel, or stainless steel. Coat exposed surfaces with additional corrosion-resistant coating if required to prevention corrosion when exposed to salt spray test for750 hours according ASTM B 117.

I. Unit Piping:

1. Unit Tubing: Copper tubing with brazed joints.

2. Unit Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.

3. Field Piping Connections: Manufacturer's standard.

4. Factory Charge: Dehydrated air or nitrogen.

5. Testing: Factory pressure tested and verified to be without leaks.

2.8 SYSTEM CONTROLS

A. General Requirements:

1. Network: Indoor units and outdoor units shall include integral controls and connect through a manufacturer-selected control network.

2. Network Communication Protocol: open control communication between interconnected units.

3. Integration with Building Automation System: ASHRAE 135, BACnet IP and certified by BACnet Testing Lab (BTL).

4. Operator Interface:
   a. Operators shall interface with system and unit controls through the following:
      1) Integration with Building Automation System.
   b. Users shall be capable of interface with controllers for indoor units control to extent privileges are enabled. Control features available to users shall include the following:
      1) On/off control.
      2) Temperature set-point adjustment.

B. Wired Controllers for Indoor Units:

1. Single controller capable of controlling multiple indoor units as group.

2. Auto Timeout Touch Screen LCD: Timeout duration shall be adjustable.

3. Multiple Language: English.

4. Temperature Units: Fahrenheit.

5. On/Off: Turns indoor unit on or off.

6. Hold: Hold operation settings until hold is released.

7. Operation Mode: Cool, Heat, Auto, Dehumidification, Fan Only, and Setback.

8. Temperature Display: 1-degree increments.

9. Temperature Set-Point: Separate set points for Cooling, Heating, and Setback.

10. Relative Humidity Display: 1 percent increments.

11. Relative Humidity Set-Point: Adjustable in 1 percent increments.

12. Fan Speed Setting: Select between available options furnished with the unit.

13. Airflow Direction Setting: If applicable to unit, select between available options furnished with the unit.

14. Seven-day programmable operating schedule with up to five events per day. Operations shall include On/Off, Operation Mode, and Temperature Set-Point.

15. Auto Off Timer: Operates unit for an adjustable time duration and then turns unit off.

16. Occupancy detection.

17. Service Notification Display: "Filter".

18. Service Run Tests: Limit use by service personnel to troubleshoot operation.

19. Error Code Notification Display: Used by service personnel to troubleshoot abnormal operation and equipment failure.

20. User and Service Passwords: Capable of preventing adjustments by unauthorized users.

21. Setting stored in nonvolatile memory to ensure that settings are not lost if power is lost. Battery backup for date and time only.

22. Low-voltage power required for controller shall be powered through non-polar connections to indoor unit.

2.9 SYSTEM REFRIGERANT AND OIL

A. Refrigerant:

1. R-410a.

B. Oil:

1. As required by VRF HVAC system manufacturer and to comply with performance requirements indicated.

2.10 SYSTEM CONDENSATE DRAIN PIPING

A. If more than one material is listed, material selection is Contractor's option.

B. Copper Tubing:

1. Drawn-Temper Tubing: According to ASTM B 88, Type M or Type DWV according to ASTM B 306.

2. Wrought-Copper Fittings: ASME B16.22.

3. Wrought-Copper Unions: ASME B16.22.

4. Solder Filler Metals: ASTM B 32, lead-free alloys, and water-flushable flux according to ASTM B 813.

2.11 SYSTEM REFRIGERANT PIPING

A. Comply with requirements in Section 23 23 00 "Refrigerant Piping" for system piping requirements.

2.12 SYSTEM CONTROL CABLE

A. Cable Rating: Listed and labeled for application according to NFPA 70.

1. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262, by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.
   a. Flame Travel Distance: 60 inches or less.
   b. Peak Optical Smoke Density: 0.5 or less.
   c. Average Optical Smoke Density: 0.15 or less.

2. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.

3. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

B. Comply with requirements in Section 26 05 33 "Raceways and Boxes for Electrical Systems" for control wiring and cable raceways.

2.13 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect factory-assembled equipment.

B. Equipment will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports for historical record. Submit reports only if requested.

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 products before installation. Reject products that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for piping and tubing to verify actual locations of connections before equipment installation.

D. Examine roughing-in for wiring and conduit to verify actual locations of connections before equipment installation.

E. Examine walls, floors, roofs, and outdoor pads for suitable conditions where equipment will be installed.

F. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION, GENERAL

A. Clearance:

1. Maintain manufacturer's recommended clearances for service and maintenance.

2. Maintain clearances required by governing code.

B. Loose Components: Install components, devices, and accessories furnished by manufacturer, with equipment, that are not factory mounted.

1. Loose components shall be installed by system Installer under supervision of manufacturer's service representative.

C. Equipment Restraint Installation: Install equipment with seismic-restraint device. Comply with requirements for seismic-restraint devices specified in Section 23 05 48 "Vibration Controls for HVAC."

3.3 INSTALLATION OF INDOOR UNITS

A. Install units to be level and plumb while providing a neat and finished appearance.

B. Unless otherwise required by VRF HVAC system manufacturer, support ceiling-mounted units from structure above using threaded rods; minimum rod size of 3/8 inch.

C. Adjust supports of exposed and recessed units to draw units tight to adjoining surfaces.

D. Protect finished surfaces of ceilings, floors, and walls that come in direct contact with units. Refinish or replaced damaged areas after units are installed.

E. In rooms with ceilings, conceal piping and tubing, controls, and electrical power serving units above ceilings.

F. In rooms without ceiling, arrange piping and tubing, controls, and electrical power serving units to provide a neat and finished appearance.

G. Provide lateral bracing if needed to limit movement of suspended units to not more than 0.25 inch.

H. For floor- and wall-mounted units that are exposed, conceal piping and tubing, controls, and electrical power serving units within walls.

I. Floor-mounted units located in mechanical rooms.

J. Install floor-mounted units on support structure indicated on Drawings.

K. Install floor-mounted units on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in other sections

L. Attachment: Install hardware for proper attachment to supported equipment.

M. Grouting: Place grout under equipment supports and make bearing surface smooth.

3.4 INSTALLATION OF OUTDOOR UNITS

A. Install units to be level and plumb while providing a neat and finished appearance.

B. Install outdoor units on support structures indicated on Drawings.

C. Roof-Mounted Installations: Install outdoor units on equipment supports specified in Section 07 72 00 "Roof Accessories." Anchor units to supports with removable, stainless-steel fasteners.

3.5 ELECTRICAL INSTALLATION

A. Comply with requirements indicated on Drawings and in applicable Division 26 Sections.

B. To extent electrical power is required for system equipment, components, and controls, and is not indicated on Drawings and addressed in the Specifications, the design for such electrical power shall be delegated to VRF HVAC system provider.

1. Delegated design of electrical power to equipment, components and controls, and associated installation shall be included at no additional cost to Owner.

C. Connect field electrical power source to each separate electrical device requiring field electrical power. Coordinate termination point and connection type with Installer.

D. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

E. Comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems" for grounding connections.

F. Install nameplate or acrylic label with self-adhesive back for each electrical connection indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated phenolic layers of black with engraved white letters. Letters at least 1/2-inch high.

2. Locate nameplate or label where easily visible.

G. Comply with requirements in Section 26 05 33 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or revised in this Section.

H. Install manufactured conduit sweeps and long-radius elbows if possible.

I. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

3.6 IDENTIFICATION

A. Identify system equipment, piping, tubing, and valves. Comply with requirements for identification specified in Section 23 05 53 "Identification for HVAC Piping and Equipment."

B. Identify system electrical and controls components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

1. Identify each control cable on each end and at each terminal with a number-coded identification tag. Each cable shall have a unique tag.

3.7 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage VRF HVAC system manufacturer's service representative to advise and assist installers; witness testing; and observe and inspect components, assemblies, and equipment installations, including controls and connections.

1. Field service shall be performed by a factory-trained and -authorized service representative] of VRF HVAC system manufacturer whose primary job responsibilities are to provide direct technical support of its products.
   a. Additional factory-authorized representatives may assist with completion of certain activities only if supervised by manufacturer's employee. A factory-authorized representative shall not provide assistance without manufacturer's employee supervision.

2. Final Inspection before Startup:
   a. Before inspection, Installer to provide written request to manufacturer stating the system is fully installed according manufacturer's requirements and ready for final inspection.
   b. All system equipment and operating components shall be inspected. If components are inaccessible for inspection, they shall be made accessible before the final inspection can be completed.

c. Manufacturer shall provide a comprehensive inspection of all equipment and each operating component that comprise the complete system(s). Inspection shall follow a detailed checklist specific to each equipment and operating component.

d. Inspection reports for indoor units shall include, but not be limited to, the following:
   1) Unit designation on Drawings.
   2) Manufacturer model number.
   3) Serial number.
   4) Network address, if applicable.
   5) Each equipment setting.
   6) Mounting, supports, and restraints properly installed.
   7) Proper service clearance provided.
   8) Wiring and power connections correct.
   9) Line-voltage reading(s) within acceptable range.
   10) Wiring and controls connections correct.
   11) Low-voltage reading(s) within an acceptable range.
   12) Controller type and model controlling unit.
   13) Controller location.
   14) Temperature settings and readings within an acceptable range.
   15) Humidity settings and readings within an acceptable range.
   16) Condensate removal acceptable.
   17) Fan settings and readings within an acceptable range.
   18) Unit airflow direction within an acceptable range.
   19) If applicable, fan external static pressure setting.
   20) Filter type and condition acceptable.
   21) Noise level within an acceptable range.
   22) Refrigerant piping properly connected and insulated.
   23) Condensate drain piping properly connected and insulated.
   24) If applicable, ductwork properly connected.
   25) If applicable, external interlocks properly connected.
   26) Remarks.

e. Inspection reports for outdoor units shall include, but not be limited to, the following:
   1) Unit designation on Drawings.
   2) Manufacturer model number.
   3) Serial number.
   4) Network address, if applicable.
   5) Each equipment setting.
   6) Mounting, supports, and restraints properly installed.
   7) Proper service clearance provided.
   8) Wiring and power connections correct.
   9) Line-voltage reading(s) within acceptable range.
   10) Wiring and controls connections correct.
   11) Low-voltage reading(s) within an acceptable range.
   12) Condensate removal acceptable.
   13) Noise level within an acceptable range.
   14) Refrigerant piping properly connected and insulated.
   15) Condensate drain piping properly connected and insulated.
   16) Remarks.

f. Installer shall provide manufacturer with the requested documentation and technical support during inspection.

g. Installer shall correct observed deficiencies found by the inspection.
h. Upon completing the on-site inspection, manufacturer shall provide a written report with complete documentation describing each inspection step, the result, and any corrective action required.
i. If corrective action is required by Installer that cannot be completed during the same visit, provide additional visits, as required, until deficiencies are resolved and systems are deemed ready for startup.
j. Final report shall indicate the system(s) inspected are installed according to manufacturer's requirements and are ready for startup.

B. Perform the following tests and inspections with the assistance of manufacturer's service representative:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. System Refrigerant Charge:

1. Using information collected from the refrigerant tubing evacuation testing, system Installer shall consult variable refrigerant system manufacturer to determine the correct system refrigerant charge.

2. Installer shall charge system following VRF HVAC system manufacturer's written instructions.

3. System refrigerant charging shall be witnessed by system manufacturer's representative.

4. Total refrigerant charge shall be recorded and permanently displayed at the system's outdoor unit.

D. Products will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.8 STARTUP SERVICE

A. Engage a VRF HVAC system manufacturer's service representative to perform system(s) startup service.

1. Service representative shall be a factory-trained and -authorized service representative of VRF HVAC system manufacturer.

2. Complete startup service of each separate system.

3. Complete system startup service according to manufacturer's written instructions.

B. Startup checks shall include, but not be limited to, the following:

1. Check control communications of equipment and each operating component in system(s).

2. Check each indoor unit's response to demand for cooling and heating.

3. Check each indoor unit's response to changes in airflow settings.

4. Check each indoor unit and outdoor unit for proper condensate removal.

5. Check sound levels of each indoor and outdoor unit.

C. Installer shall accompany manufacturer's service representative during startup service and provide manufacturer's service representative with requested documentation and technical support during startup service.

1. Installer shall correct deficiencies found during startup service for reverification.

D. System Operation Report:

1. After completion of startup service, manufacturer shall issue a report for each separate system.

2. Report shall include complete documentation describing each startup check, the result, and any corrective action required.

3. Manufacturer shall electronically record not less than two hours of continuous operation of each system and submit with report for historical reference.
   a. All available system operating parameters shall be included in the information submitted.

E. Witness:

1. Invite Commissioning Agent to witness startup service procedures.

2. Provide written notice not less than 20 business days before start of startup service.

3.9 ADJUSTING

A. Adjust equipment and components to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust initial temperature and humidity set points. Adjust initial airflow settings and discharge airflow patterns.

C. Set field-adjustable switches and circuit-breaker trip ranges according to VRF HVAC system manufacturer's written instructions, and as indicated.

D. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.10 PROTECTION

A. Protect products from moisture and water damage. Remove and replace products that are wet, moisture damaged, or mold damaged.

B. Protect equipment from physical damage. Replace equipment with physical damage that cannot be repaired to new condition. Observable surface imperfections shall be grounds for removal and replacement.

C. Protect equipment from electrical damage. Replace equipment suffering electrical damage.

D. Cover and seal openings of equipment to keep inside of equipment clean. Do not remove covers until finish work is complete.

3.11 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of system Installer who are manufacturer's authorized service representative. Include two service visits for preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper equipment and system operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.12 DEMONSTRATION

A. Engage a VRF HVAC system manufacturer's factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain entire system.

B. Instructor:

1. Instructor shall be factory trained and certified by VRF HVAC system manufacturer with current training on the system(s), equipment, and controls that are installed.

2. Instructor's credentials shall be submitted for review by Commissioning Agent before scheduling training.

3. Instructor(s) primary job responsibility shall be Owner training.

4. Instructor(s) shall have not less than three years of training experience with VRF HVAC system manufacturer and past training experience on at least three projects of comparable size and complexity.

C. Schedule and Duration:

1. Schedule training with Owner at least 20 business days before first training session.

2. Training shall occur before Owner occupancy.

3. Training shall be held at mutually agreed date and time during normal business hours.

4. Each training day shall not exceed eight hours of training. Daily training schedule shall allow time for one-hour lunch period and 15-minute break after every hour of training.

5. Perform not less than eight total hours of training.

D. Location: Owner shall provide a suitable on-site location to host classroom training.

E. Training Attendees: Assume three people.

F. Training Attendance: For record purposes, document training attendees at the start of each new training session. Record attendee's name, signature, phone number, and e-mail address.

G. Training Format: Individual training modules shall include classroom training followed by hands-on field demonstration and training.

H. Training Materials: Provide training materials in electronic format to each attendee.

1. Include instructional videos showing general operation and maintenance that are coordinated with operation and maintenance manuals.

2. Video record each classroom training session and submit an electronic copy to Owner before requesting Owner acceptance of training.

I. Acceptance: Obtain Commissioning Agent written acceptance that training is complete and requirements indicated have been satisfied.

END OF SECTION 238129

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Specification Section "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advance Products & Systems, Inc.
b. CALPICO, Inc.
c. Metraflex Company (The).
d. Pipeline Seal and Insulator, Inc.
e. Proco Products, Inc.

2. Sealing Elements: Nitrile (Buna N) rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Unless otherwise indicated, cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level or top of curb. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for sufficient annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for sufficient annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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.
3. Sleeves.

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. 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. 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. American Insulated Wire Corp.; a Leviton Company.
2. General Cable Corporation.
3. Southwire Company.
4. Pirelli.
5. Superior Essex.
6. The Okonite Company

B. Copper Conductors: Class B, Concentric-lay, stranded conductors. Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN, UF, and USE.

D. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC, Type SO, and Type USE all with insulated ground wire.

E. Metal Clad Cable Type MC: Aluminum or galvanized steel armor, color coded 90-deg. C THHN-THWN insulated copper conductors with full size green insulated grounding 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:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Minimum size: General, #12 AWG; over 100 feet at 120 volts and 200 feet at 277 volts, #10 AWG; over 150 feet at 120 volts and 300 feet at 277 volts, #8 AWG. Control wiring, #14 AWG; over 200 feet at 120 volts and 400 feet at 208 volts, #12 AWG. For longer runs increase wire size so as not to exceed 2% voltage drop in feeders and 3% voltage drop in branch circuits. Where conductor size is not indicated, its current carrying capacity shall be equal to or greater than the rating of its overcurrent protective device or it shall be the minimum conductor size, whichever is larger.

B. Where no dimensions are assigned to a wire size it shall be understood to be the wire gauge or circular mil size indicated in the NEC tables. The abbreviations MCM, KCM, kcmil and the like are used interchangeably throughout these documents and refer to thousands of circular mils cross-sectional area of the conductor unless otherwise indicated.

C. Where conductor size is not indicated, its current carrying capacity shall be equal to or greater than the rating of its overcurrent protective device.

D. Where conductor sizes are increased for voltage drop or other reasons the equipment grounding conductor shall be increased in size proportionately.

E. Where conductors sizes are increased for voltage drop they may be reduced in size within ten feet of the termination in order to fit under the lugs available on the overcurrent protective device but not less than the ampacity of the frame size of the overcurrent protective device.

F. Service Entrance Conductors; Underground in raceway: Type THHN-THWN, 90 Degree C., single copper conductors in raceway.

G. Feeders; Underground in raceway: Type THHN-THWN, 90 Degree C., single copper conductors in raceway.

H. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground Beneath Buildings or Structures: Type THHN-THWN, 90 Degree C., single copper conductors in raceway.

I. Feeders; Interior in raceway: Type THHN-THWN, 90 Degree C., copper conductor.

J. Elevator Feeder: Type THHN-THWN copper conductor in raceway.

K. Branch Circuits; Underground: Type THHN-THWN, 90 Degree C., single copper conductors in raceway.

L. Branch Circuits Concealed in Concrete, Below Slabs-on-Grade, and Underground Beneath Buildings or Structures: Type THHN-THWN, 90 Degree C., single copper conductors in raceway.

M. Branch Circuits; Interior: Type THHN, 90 Degree C., copper conductor in raceway.

N. Branch Circuit Homeruns: Type THHN, copper conductor, in raceway from panelboards to first outlet box. Homerun, individual and multiple circuit cables are not to be run from panelboards. After the first outlet box, approved cable may be used.

O. Branch Circuits: For wiring #10 AWG and smaller in non health care facilities in gypsum board partitions, ceiling spaces, and for connections from raceway outlet boxes to lighting fixtures and equipment, Type MC Metal Clad Cable.

P. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh strain relief device at terminations to suit application.

Q. Class 1 Control Circuits: Type THHN-THWN, in raceway.

R. Class 2 Control Circuits: Type THHN-THWN, in raceway or Power-limited cable, concealed in building finishes.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Service entrance conductors in raceway shall enter directly into the service disconnecting means through the wall or floor at the exterior wall of the building or structure.

B. Where service entrance conductors must be run through or under any portion of the building or structure to reach the service disconnecting means the raceway shall be covered by or encased in not less than 2-inches of concrete supported from the building or structure in an approved manner.

C. Install direct burial cables on a 2-inch minimum depth fine sand bed with a 4-inch minimum layer of same material covering the conductors. Install in raceway under pavement and planter areas and within three feet of structures. Provide line marker tape.

D. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

E. Install cables concealed in ceiling spaces, in gypsum board partitions and in hollow spaces of interior masonry walls in dry locations.

F. Where cables are installed above new or existing accessible tile ceilings they shall be supported by acoustical tile support clips so the cables do not rest on the ceiling tiles.

G. Where cables are not fished in existing spaces they shall be securely fastened to the building structure at intervals prescribed by the NEC and not pulled through rings or wiring harnesses.

H. 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.

I. Use pulling means; including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

J. Pull no more than one 3-phase circuit or three consecutive 1-phase circuits in same raceway unless otherwise indicated.

K. The grounded circuit conductors, or neutral conductors, for lighting circuits being controlled by switches or dimmers shall be provided at the switch and dimmer locations and shall be connected to the appropriate terminal on the switches and dimmers if one is present.

L. Support cables according to Electrical Specifications.

M. Bundle incoming and outgoing feeder conductors together in switchboards and wrap with wire ties 6-inches on center up to within 6-inches of their termination. Ties shall be of sufficient strength to withstand device short circuit rating.

N. Seal around cables penetrating fire-rated elements.

O. Identify and color-code conductors and cables.

3.4 CONNECTIONS

A. Branch circuit and feeder taps shall be full circuit size up to their overcurrent protection device unless otherwise indicated.

B. Taps and splices for branch circuits and feeders larger than #10 AWG shall be made with Burndy “Insul-Tap” Type BIPC, or approved equal, insulation piercing connectors or Burndy “Hylug”, or approved equal, compression splices.

C. Taps and splices for branch circuits and feeders #10 AWG and smaller shall be made with Ideal Models 410, 411 and 412 crimp connectors, or approved equal, with Models 415 or 417 insulated caps.

D. Connections to fixture and motor leads #10 AWG and smaller shall be made with 3M "Scotchlok" pre-insulated spring pressure connectors Types Y, R or G or approved equal.

E. Stranded wiring conductors shall be made up to screw terminals of terminal blocks with 3M, T&B or Panduit locking fork crimp terminals with nylon insulated grips.

F. 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.

G. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

H. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
2. For sleeve rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Cut sleeves to length for mounting flush with both wall surfaces.

G. Extend sleeves installed in floors 2 inches above finished floor level.

H. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint.

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials.

L. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

M. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

N. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Electrical Specification Section Penetration Firestopping.

3.7 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 for compliance with requirements.

2. Visual and Mechanical Inspections: Include the following inspections and related work.

   a. Verify cables and conductors comply with contract documents.
   b. Verify cables and conductors are braced for short circuit stresses where specified.
   c. Verify cables and conductors are correctly identified at each termination, splice and tap where applicable.
   d. Verify correct phase rotation is maintained throughout project.
   e. Verify color coding and identification comply with specifications and the National Electrical Code.
   f. Inspect all exposed sections of cables and conductors for physical damage and correct connection.
   g. Inspect all bolted and compression connections.

3. Electrical Tests: Include the following items.

   a. Insulation resistance tests of all conductors, cables and connections.

4. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

5. Verify phase identification is A, B, C, left to right, front to back and top to bottom. If corrections are required change feeder and branch circuit identification at each end of circuit so that correct phase identification is maintained throughout the project. If incorrect identification is noted on existing systems notify the Architect/Engineer for action to be taken.
6. Perform the following infrared scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice and termination in feeder cables and conductors. Remove all covers so terminations, joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of the components 11 months after date of Substantial Completion.
    c. Instrument and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviation from normal values. Provide calibration record for device.
    d. Record of Infrared Scanning: Prepare a certified report that identifies components checked and that describes scanning results. Include the following:

        1) Item Identification.
        2) Date.
        3) Time.
        4) Location.
        5) Equipment Identification/Description.
        6) Component Identification/Description.
        7) Color Photograph of Component.
        8) Thermal Infrared Photograph of Component.
        9) Ambient Temperature.
        10) Component Temperature, Phase I.D. and whether line or load side.
        11) Notation of and deficiencies or abnormalities, probable causes, and recommendations.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment, plus the following special applications:
   1. Underground distribution grounding.
   2. Common ground bonding with lightning protection system.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:

   1. Test wells.
   2. Ground rods.
   3. Ground rings.
   4. Grounding arrangements and connections for separately derived systems.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For grounding to include the following in emergency, operation, and maintenance manuals:

   1. Instructions for periodic testing and inspection of grounding features.

      a. Tests shall be to determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not.
      b. Include recommended testing intervals.

1.3 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. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper or tinned-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.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Intersystem Bonding Termination Device: A bonding bar or listed device for connecting data, alarm, communication and lightning protection systems.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel,; 3/4 inch diameter by 10 feet long.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches (600 mm) below grade.

C. 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 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. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system intersystem bonding termination device to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

E. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Common Ground Bonding with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Intersystem Bonding Termination Device: Locate in the service equipment or near a grounding electrode conductor. Connect to the grounding electrode conductor with a #6 AWG copper conductor or directly via a listed split or snap-in connector. The grounding electrode conductor shall not be broken.

D. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
2. 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.

E. 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.

F. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

G. 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, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, 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.
4. Gas appliances electrically connected by cord and plug shall have separate bonding conductors connected to the branch circuit equipment grounding conductors at the outlets serving the appliances. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

H. Grounding for Cable Sleeves and Stubs:
1. Each metallic sleeve for cables passing through a non-fire-rated wall or slab between metallic cable trays or from metallic cable trays to grounded or bonded equipment shall contain an equipment grounding conductor to connect the cable tray equipment grounding conductors and the equipment to provide effective continuity of the ground path and shall be bonded to the cable trays and equipment at each end of the sleeve.
2. Each metallic sleeve for cables passing through a fire-rated wall or slab between metallic cable trays or from metallic cable trays to grounded or bonded equipment shall contain an equipment grounding conductor to connect the cable tray equipment grounding conductors and the equipment to provide effective continuity of the ground path and shall be bonded to the cable trays and equipment at each end of the sleeve. The bonding shall not interfere with the design function of the fire stopping.
3. Conduit stubs used for cables from wall outlets up to the ceiling space for transition to metallic cable tray system and are terminate 30-inches or less from the cable tray or other grounded or bonded object shall be bonded to the that cable tray or object.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

3. 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. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
5. Substations and Pad-Mounted Equipment: 5 ohms.
6. Manhole Grounds: 10 ohms.

C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Concrete equipment bases.

B. Related Sections include the following:

1. Electrical Specification Section "Electrical Supports and Seismic Restraints" for products and installation requirements necessary for compliance with seismic criteria.

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.

D. Concrete

1. Action Submittals

a. Product Data: For each type of product indicated.
b. LEED Submittals:

1) Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2) Design Mixtures for Credit ID 1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements. For each design mixture submitted, include an equivalent concrete mixture that does not contain portland cement replacements, to determine amount of portland cement replaced.

c. Other Action Submittal:

1) Design Mixtures: For each concrete mixture.

2. 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.

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 reports.
g. Minutes of preinstallation conference.

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.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. GS Metals Corp.
e. Thomas & Betts Corporation.
f. Unistrut; Tyco International, Ltd.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.; a division of Cooper Industries.
    c. Fabco Plastics Wholesale Limited.

2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
3. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
4. Rated Strength: Selected to suit applicable load criteria.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Hilti Inc.
        2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        3) MKT Fastening, LLC.

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:

      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.

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.

2.3 SUPPORT SYSTEMS NOT PERMITTED

A. Unless specifically indicated otherwise, or in accordance with the National Electrical Code and with the written permission of the Engineer, the following means of securing or supporting shall not be used.

1. Cables and raceways shall not be secured to or supported by ceiling grids.
2. Cables and raceways shall not be secured to or supported by ceiling support assemblies, including ceiling support wires and rods.
3. Cables and raceways shall not be used as a means to support other cables and raceways.
4. Cables, raceways and electrical equipment shall not be secured to or supported by piping, ductwork or equipment of other trades.

2.4 CONCRETE BASES

A. General: Design electrical work concrete for 3000 psi 28-day compressive strength class:

B. Portland Cement: ASTM C 150 Type I, except as otherwise indicated.

C. Aggregates: ASTM C 33, except as otherwise indicated.

D. Local Aggregate not complying with ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used.

E. Water: Clean and free of substances harmful to concrete.

F. Mix for Patching: Where electrical work requires patching of exposed concrete, sidewalks or curbing which has been cut to accommodate electrical work, provide concrete patching mix of work being patched (same cement, aggregates, admixtures and proportioning).

G. Job Site Mixing: Mix materials for concrete in drum-type batch machine mixer. For mixers of 1.0 cu. yd., or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after all ingredients are in mixer, before any part of batch is released.

H. Forms for Concrete: Smooth lumber, plywood or other easy release material; reinforced to prevent excessive deflection or possibility of failure during placement of concrete; sufficiently heavy for construction to prevent leakage which would be harmful to structural quality of concrete.

I. Exposed Corner Chamfer Strips: Provide wood, metal, plastic or rubber chamfer strips in forms at exposed external corners of concrete.

J. Form Coating Compound: Commercially formulated compound, which will prevent bond of concrete to forms. Provide compound recommended by manufacturer for application indicated, and which will not stain concrete or subsequent painting of exposed surfaces.

K. Reinforcing Bars: Except as otherwise indicated, provide ASTM A 615, deformed, Grade 40 for size numbers 3 through 18; ASTM A 675, plain, Grade 50, for size number 2; sizes as shown.

L. Steel Wire: ASTM A 82, plain, cold-drawn.

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 and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted 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 single-bolt conduit clamps or single-bolt conduit clamps using spring friction action for retention in support channel.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

E. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

F. Dry Locations: Steel materials.

G. Support Clamps for PVC Raceways: Click-type clamp system.

H. Selection of Supports: Comply with manufacturer's written instructions.

I. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Comply with mounting and anchoring requirements.

C. Raceway Support Methods: In addition to methods described in NECA 1, EMT and RMC may be supported by openings through structure members, as permitted in NFPA 70.

D. 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.

E. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes,

transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

F. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

G. Install support devices to securely and permanently fasten and support electrical components.

H. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

I. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

J. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

K. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

L. Install 1/4-inch- diameter or larger threaded steel hanger rods, unless otherwise indicated.

M. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

N. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

O. Simultaneously install vertical conductor supports with conductors.

P. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

Q. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

R. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

S. Provide bushings on each end of sleeves used for cables. Use insulated bushings on sleeves 1-1/4-inch and larger.

T. Do not support lighting fixtures, equipment, etc. from metal decks; provide channel iron spanning and fastened to two adjacent joists, beams, purlins, columns or girts to support anything heavier than branch circuit conduit and wiring.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete.

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 "Finishes" Division Specification Sections "Painting" and "High Performance Coatings" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

1.2 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. FMC: Flexible metal conduit.

D. GRC: Galvanized rigid steel conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. PVC: Polyvinyl chloride conduit.

H. RNC: Rigid nonmetallic conduit.

1.3 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit IEQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of

Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions; including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements,available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Allied Tube & Conduit; a Tyco International Ltd. Co.
2. Anamet Electrical, Inc.
3. Electri-Flex Company.
4. O-Z/Gedney; a brand of EGS Electrical Group.
5. Southwire Company.
6. Thomas & Betts Corporation.
7. Wheatland Tube Company; a division of John Maneely Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. EMT: Comply with ANSI C80.3 and UL 797.

E. FMC: Comply with UL 1; zinc-coated steel.

F. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

   a. Material: Steel.
   b. Type: Setscrew or compression, raintight for outdoor applications.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

H. Joint Compound for GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Anamet Electrical, Inc.
2. CANTEX Inc.
3. CertainTeed Corp.
4. Condux International, Inc.
5. Electri-Flex Company.
6. Lamson & Sessions; Carlon Electrical Products.
7. RACO; a Hubbell company.
8. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. LFNC: Comply with UL 1660.

E. Fittings for RNC: Comply with NEMA TC 3; match to conduit type and material.

F. Fittings for LFNC: Comply with UL 514B.

G. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

H. Solvent cements and adhesive primers 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."

I. Transition to metal conduit or connect to metal floor boxes with concrete tight fittings.

1. Use female adapter for transition to galvanized threaded rigid steel conduit.
2. Use female adapter and EMT connector for transition to electrical metallic tubing.
3. Use male terminal adapters for connection to cast metal floor boxes.
4. Use male terminal adapters with flat washers and PVC locknuts for connection to stamped steel floor boxes.

2.3 OPTICAL FIBER/COMMUNICATIONS CABLE RACEWAY AND FITTINGS

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. Arnco Corporation
2. Endot Industries, Inc.
3. IPEX, Inc.
4. Lamson & Sessions; Carlon Electrical Products.

B. Description: Comply with UL 2024; flexible type, approved for plenum installation

2.4 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.
2. Hoffman; a Pentair company.
3. Mono-Systems, Inc.
4. Square D; a brand of Schneider Electric.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, indoors Type 3R outdoors or wet locations unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.5 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard ivory enamel finish in color selected by Architect.

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. Mono-Systems, Inc.
b. Panduit Corp.
c. Wiremold / Legrand.

2.6 BOXES, ENCLOSURES, AND CABINETS

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. Adalet.
2. Cooper Technologies Company; Cooper Crouse-Hinds.
3. EGS/Appleton Electric.
4. Erickson Electrical Equipment Company.
5. FSR Inc.
6. Hoffman; a Pentair company.
7. Hubbell Incorporated; Killark Division.
8. O-Z/Gedney; a brand of EGS Electrical Group.
9. RACO; a Hubbell Company.
10. Spring City Electrical Manufacturing Company.
11. Thomas & Betts Corporation.
12. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Metal Floor Boxes:

1. Comply with NEMA OS 1 and UL 514A.
2. Material: Cast metal in slabs on or below grade, concrete-tight sheet metal in slabs above grade.
3. Type: Fully adjustable.
4. Shape: Rectangular.
5. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Nonmetallic Floor Boxes: Nonadjustable, round for single device outlets; rectangular for multiple device outlets.

1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Floor Box Covers and Flanges: Cast aluminum; black, gray, brass, aluminum, or ivory finish as indicated or directed. UL listed for scrub water exclusion.

I. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb . Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

J. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

K. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

L. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

M. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

N. Gangable boxes are allowed.

O. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 indoors, Type 3R outdoors or wet locations 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.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

P. Cabinets:

1. NEMA 250, Type 1 indoors, Type 3R outdoors or wet location galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.

4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC.
3. Underground Conduit: RNC, Type EPC-40-PVC or Type EPC-80-PVC, direct buried or concrete encased.
    a. Use concrete encasement for raceways passing under roadways, parking areas, and other areas subject to heavy vehicular traffic.
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 unless otherwise indicated.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.
    d. Gymnasiums.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. In Concrete Slabs: RNC, Type EPC 40 PVC with concrete-tight fittings and PVC elbow stub-ups with transition to EMT].
6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
7. Damp or Wet Locations: GRC.
8. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical fiber/communications cable raceway or EMT.
9. Raceways for Optical Fiber or Communications Cable Risers in Vertical Shafts: Riser-type, optical fiber/communications cable raceway or EMT.
10. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: [Plenum-type, optical fiber/communications cable raceway or EMT.
11. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer; and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew, steel fittings. Use raintight steel compression fittings in wet locations.. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install surface raceways only where indicated on Drawings.

F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

G. Hazardous Locations: Use rigid steel conduit and threaded fittings of NEMA type listed and labeled for the location and class of hazard indicated.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Electrical Specifications Section "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Raceways Embedded in Slabs:

1. Install in middle 1/3 of slab thickness where practical and leave at least 2 inches (50 mm) of concrete cover.
2. Do not install raceways in slabs less than 6-inches thick without written permission of the Architect and/or Structural Engineer.
3. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement
4. Space raceways laterally to prevent voids in concrete.
5. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m)intervals.
6. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
7. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
8. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. 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.

L. Conceal conduit and EMT within finished wall, ceilings, and floors, unless otherwise indicated.

M. 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.

N. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

O. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

P. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

Q. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

R. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

S. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

T. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

U. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:
1. 3/4-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet.
3. Install with a maximum, of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

V. Install electrical nonmetallic tubing and electrical flexible tubing inside conduits where indicated for telecommunications, video or data cables.

W. Surface Raceways:

1. Install surface raceway with a minimum 2-inch (50-mm)radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

X. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

Y. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

Z. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

AA. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F) and that has straight-run length that exceeds 25 feet . Install in each run of aboveground RMC conduit that is located where environmental

temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.

2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

BB. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC in damp or wet locations not subject to severe physical damage.

CC. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

DD. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

EE. Locate boxes so that cover or plate will not span different building finishes.

FF. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

GG. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

HH. Recessed Boxes in Fire Rated Walls and Partitions: Provide steel electrical boxes or listed electrical boxes in maximum two-hour fire-resistant walls and partitions in accordance with International Building Code “Penetrations”.

1. Steel electrical boxes shall not exceed the area specified in International Building Code "Penetrations". The maximum membrane penetration shall not exceed the maximum area per unit area of wall or partition specified in International Building Code "Penetrations".
2. Listed electrical boxes shall be installed in accordance with the instructions included in the listing.
3. Electrical boxes in opposite sides of fire-resistant walls and partitions with a maximum two-hour rating shall be steel and shall be separated as specified in International Building Code "Penetrations".

II. Set metal floor boxes level and flush with finished floor surface.

JJ. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

KK. Use suitable boxes and flanges for wood, carpet, and tile floor. Allow for movement of wood floors.

LL. Provide flush tile flanges in gym floors.

MM. Provide flush tile flanges in rooms and spaces to receive floor tile. Refer to finish schedule.

NN. Provide carpet flanges to cover the cut carpet edges in rooms and spaces to receive carpeting. Refer to finish schedule.

OO. Select floor boxes and flanges for use in wood floors to cover filler material and provide adequate support for devices and plates.

PP. Installed hinged cover enclosures and cabinets plumb. Support at each corner.

QQ. Do not install nonmetallic conduit, boxes, or fittings in plenums or in spaces used for the supply, return, or exhaust of environmental air.

RR. Telecommunications: Where indicated, provide orange electrical flexible tubing (EFT) and/or yellow electrical nonmetallic tubing (ENT) in telephone and communications raceways. Tubing shall be installed in continuous lengths within the conduits between access points, no connectors, couplings, adapters, or splices of any kind will be permitted within the raceway. Provide sufficient slack tubing in manholes and handholes to allow the ends of the tubing top be trained around the inside and connected together. Provide 3 ft. of slack tubing at the pole top and in the building.

3.3 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 260543 - UNDERGROUND DUCTS AND UTILITY STRUCTURES

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 and in single duct runs.
2. Handholes and boxes.

1.2 DEFINITION

A. RNC: Rigid nonmetallic conduit.

B. Duct: The general term for electrical conduit and other raceway, either metallic or nonmetallic, specified for use underground, embedded in earth or concrete.

C. Duct Bank: A group of two or more ducts in a continuous run between two points.

D. Handhole: A below-the-surface enclosure in connection with ducts into which people reach, but do not enter, for the purpose of installing, operating, or maintaining equipment or wiring.

1.3 ACTION 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, boxes and other utility structures.
4. Warning tape.
5. Warning planks.

B. Shop Drawings for Precast or Factory-Fabricated Underground Utility Structures: Include plans, elevations, sections, details, attachments to other work, and accessories, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Reinforcement details.
3. Frame and cover design and manhole frame support rings.
4. Grounding details.
5. Dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
6. Joint details.

C. Shop Drawings for Factory-Fabricated Handholes and Boxes Other Than Precast Concrete: Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Cover design.
3. Grounding details.
4. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.4 INFORMATIONAL SUBMITTALS

A. Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.

1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
2. Drawings shall be signed and sealed by a qualified professional engineer.

B. Product Certificates: For concrete and steel used in precast concrete 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.

1.5 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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

B. Store precast concrete and other factory-fabricated underground utility structures at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.

C. Lift and support precast concrete units only at designated lifting or supporting points.

1.7 COORDINATION

A. Coordinate layout and installation of ducts, handholes, and 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, and boxes 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.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

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. Rigid Nonmetallic Conduit: NEMA TC 2, Type EPC-40-PVC, UL 651, with match fittings by the same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

B. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPS Methods 24).

C. Accessories:

1. 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.
2. Warning Tape: Underground-line warning tape.
3. Concrete Warning Planks: Nominal 12 by 24 by 3 inches in size, manufactured from 6000-psi concrete.

    a. Color: Red dye added to concrete during batching.
    b. Mark each plank with "ELECTRIC" in 2-inch- high, 3/8-inch-deep letters.

2.3 PRECAST CONCRETE HANDHOLES AND BOXES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carder Concrete Products.
2. Christy Concrete Products.
3. Elmhurst-Chicago Stone Co.
4. Oldcastle Precast Group.
5. Riverton Concrete Products; a division of Cretex Companies, Inc.
6. Utility Concrete Products, LLC.
7. Utility Vault Co.
8. Wausau Tile, Inc.

B. Comply with ASTM C 858 for design and manufacturing processes.

C. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.

1. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.

2. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
3. Cover Legend: Molded lettering, "ELECTRIC.", "TELEPHONE." or as required to identify type of service.
4. Configuration: Units shall be designed for flush burial and have closed bottom, unless otherwise indicated.
5. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.

    a. Extension shall provide increased depth of 6 inches.
    b. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.

6. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks plus an additional 12 inches vertically and horizontally to accommodate alignment variations.

    a. Windows shall be located no less than 6 inches from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
    b. Window opening shall have cast-in-place, welded wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
    c. Window openings shall be framed with at least two additional No. 4 steel reinforcing bars in concrete around each opening.

7. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

a. Type and size shall match fittings to duct or conduit to be terminated.
b. Fittings shall align with elevations of approaching ducts and be located near interior corners of handholes to facilitate racking of cable.

8. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.4 HANDHOLES AND 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 closed 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, "ELECTRIC.", "TELEPHONE." or as required to identify type of service.
6. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected 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 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.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Armorcast Products Company.
b. Carson Industries LLC.
c. CDR Systems Corporation.
d. Quazite; a Division of Hubbell.

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with covers of fiberglass.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Carson Industries LLC.
b. Christy Concrete Products.
c. Nordic Fiberglass, Inc.

2.5 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. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40 PVC, in concrete-encased duct bank, under roadways and parking areas unless otherwise indicated.

B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.

C. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.

D. Underground Ducts for Telephone, Communications, or Data Utility Service Cables: RNC, NEMA Type EPC-40-PVCinstalled in direct-buried duct bank, unless otherwise indicated.

E. Underground Ducts Crossing Driveways, Roadways, and Parking Areas RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

3.2 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600 V and Less,Including Telephone, Communications, and Data Wiring:

1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-20 structural load rating.
2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 or Polymer concrete, SCTE 77, Tier 15 structural load rating.

3.3 EARTHWORK

A. Excavation and Backfill: Comply with Earthwork Specification.

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. Slope: Pitch ducts a minimum slope of 1:300 down toward handholes and away from buildings and equipment.

B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches~~,~~ both horizontally and vertically, at other locations, unless otherwise indicated.

C. 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.

D. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building.

E. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.

F. Pulling Cord: Install 100-lbf- (445-N-) test nylon cord in ducts, including spares.

G. 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; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
2. Concreting Sequence: Pour each run of envelope between manholes or other 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. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.

4. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
5. 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.
6. Minimum Space between Ducts: 3 inches between ducts and exterior envelope wall, 2 inches between ducts for like services, and 4 inches between power and signal ducts.
7. Stub-Ups: Use manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Extend concrete encasement throughout the length of the elbow.
8. Stub-Ups: Use manufactured rigid steel conduit elbows for stub-ups at poles and 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. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.

9. 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.

H. Direct-Buried Duct Banks:

1. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
2. 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 displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.
3. Excavate trench bottom to provide firm and uniform support for duct bank
4. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand-place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal.
5. Install ducts with a minimum of 3 inches between ducts for like services and 6 inches between power and signal ducts.
6. Depth: Install top of duct bank at least 36 inches below finished grade, unless otherwise indicated.
7. Set elevation of bottom of duct bank below the frost line.

8. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
9. Install manufactured rigid steel conduit elbows for stub-ups at poles and 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 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.

10. Warning Planks: Bury warning planks approximately 12 inches above direct-buried ducts and duct banks, placing them 24 inches o.c. Align planks along the width and along the centerline of duct bank. Provide an additional plank for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional planks 12 inches apart, horizontally.

3.5 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Precast Concrete Handhole Installation:

1. Comply with ASTM C 891, unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

B. Elevations:
1. Install handholes with bottom below the frost line, 48-inches below grade.
2. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch above finished grade.
3. Where indicated, cast handhole cover frame integrally with handhole structure.

C. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.

3.6 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use 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 bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set so cover surface will be flush with finished grade. Set covers of other handholes 1 inch above finished grade.

D. Install handholes and 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. Select 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 similar materials 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 with a troweled finish.
2. Dimensions: 10 inches wide by 12 inches deep.

3.7 GROUNDING

A. Ground underground ducts and utility structures.

3.8 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 and utility structures.
2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
3. Test handhole 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.

3.9 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.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION 260543

SECTION 260548 – ELECTRICAL SUPPORTS AND SEISMIC RESTRAINTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Isolation pads.
2. Spring isolators.
3. Restrained spring isolators.
4. Channel support systems.
5. Restraint cables.
6. Hanger rod stiffeners.
7. Anchorage bushings and washers.

B. Related Sections include the following:

1. Electrical Specification Section "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.2 DEFINITIONS

A. The IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC or Seismic Design Group as defined in ASCE 7: D.
2. Assigned Seismic Use Group or Building Category as Defined in the IBC and ASCE 7: [I] [II] [III] [IV].

a. Component Importance Factor (Ip) as defined in ASCE 7:
1) All Exit and Emergency Lighting and Power Systems in any Occupancy Category: 1.5
2) All Fire Alarm Systems and Equipment in any Occupancy Category: 1.5
3) All other Electrical Systems, Equipment and Devices in Occupancy Category IV structures: 1.5
4) All other Electrical Systems, Equipment and Devices in Occupancy Category III structures: 1.25

5) All other Electrical Systems, Equipment and Devices in Occupancy Category I and II structures: 1.0

b. Component Response Modification Factor (Rp) as defined in ASCE 7:
   1) Generators, batteries, inverters, motors, transformers, and other electrical components of high deformability materials. 2.5
   2) Motor control centers, panelboards, switchboards, switchgear, instrumentation cabinets, and other electrical components of sheet metal framing. 6.0
   3) Lighting fixtures. 1.5
   4) Conduit, bus ducts and rigidly mounted cable trays. 2.5
   5) Suspended cable trays. 6.0
   6) All other electrical components. 1.5

c. Component Amplification Factor (ap) as defined in ASCE 7.
   1) Generators, batteries, inverters, motors, transformers, and other electrical components of high deformability materials. 1.0
   2) Motor control centers, panelboards, switchboards, switchgear, instrumentation cabinets, and other electrical components of sheet metal framing. 2.5
   3) Lighting fixtures. 1.0
   4) Conduit, bus ducts and rigidly mounted cable trays. 1.0
   5) Suspended cable trays. 2.5
   6) All other electrical components. 1.0

3. Design Spectral Response Acceleration at Short Periods (0.2 Second): Select from IBC Seismic Hazard Map.

4. Design Spectral Response Acceleration at 1.0-Second Period: Select from IBC Seismic Hazard Map.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

   a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
   b. Annotate to indicate application of each product submitted and compliance with requirements.

3. Restrained-Isolation Devices: Include ratings for horizontal, vertical, and combined loads.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators and seismic restraints.

a. Coordinate design calculations with wind-load calculations required for equipment mounted outdoors. Comply with requirements in other electrical Sections for equipment mounted outdoors.

2. Indicate materials and dimensions and identify hardware, including attachment and anchorage devices.
3. Field-fabricated supports.
4. Seismic-Restraint Details:

a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
c. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.

B. Qualification Data: For professional engineer and testing agency.

C. Welding certificates.

D. Field quality-control test reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

E. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Pads: Arrange in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.

B. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- (6-mm-) thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig (3447 kPa).
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

C. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Restraint: Seismic or limit-stop as required for equipment and authorities having jurisdiction.

3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.2 SEISMIC-RESTRAINT DEVICES

A. 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. Mason Industries.
2. Vibration Mountings & Controls, Inc.
3. Isolation Technology, Inc.

B. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

D. Restraint Cables: ASTM A 603 galvanized steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

E. Hanger Rod Stiffener: Reinforcing steel angle clamped to hanger rod. Do not weld stiffeners to rods.

F. Bushings for Floor-Mounted Equipment Anchor: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchors and studs.

G. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices.

H. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

I. Mechanical Anchor: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchors with strength

required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

J. Adhesive Anchor: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.3 FACTORY FINISHES

A. Finish: Manufacturer's standard prime-coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment and Hanger Restraints:

1. Install restrained isolators on electrical equipment.
2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

D. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Architect, Construction Manager, and Owner, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.
9. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust isolators after isolated equipment is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 260548

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

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 ANSI A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.4 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's

wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage.

C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.2 METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Colors for Raceways Carrying Circuits at 600 V and Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage.

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.

D. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

E. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

F. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.5 FLOOR MARKING TAPE

A. 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.6 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

2.7 WARNING LABELS AND SIGNS

A. Comply with NFPA 70, 29 CFR 1910.145, and ANSI Z535.

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 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
3. Arc Flash Warning: "DANGER – ARC FLASH HAZARD.
4. Available Fault Current Warning: "MAXIMUM AVAILABLE FAULT CURRENT _____ DATE ___/___/_____ "with the maximum available fault current calculation was performed".

2.8 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.

2.9 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.10 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.

2.11 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors,

at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

H. 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.

I. 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. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30A, and 120V to ground: Identify with self-adhesive vinyl label or self-adhesive vinyl tape applied in bands. Install labels at 30-foot maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.
3. UPS.

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in low-voltage switchgear, switchboards, panelboards, motor control centers, enclosed switches, transformer compartments, vaults, pull and junction boxes, manholes, handholes, etc., use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for service, feeder, and branch-circuit conductors throughout the electrical system.

2. Color code 208Y/120 volt, 3 phase, 4 wire system secondary service, feeder and branch circuit conductors throughout the electrical system as follows:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.
d. Neutral: White.
e. Ground: Green.

3. Color code 480Y/277 volt, 3 phase, 4 wire system secondary service, feeder and branch circuit conductors throughout the electrical system as follows:

a. Phase A: Brown.

b. Phase B: Orange.
c. Phase C: Yellow.
d. Neutral: White with a colored stripe or gray.
e. Ground: Green

D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

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.

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 both direct-buried cables and cables in raceway.

G. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

H. 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.

I. 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.

J. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch high letters for emergency instructions at equipment used for power transfer.

K. Available Fault Current Warning: Service Equipment shall be labeled with the MAXIMUM AVAILABLE FAULT CURRENT and the DATE the fault current calculation specified in

Electrical Specification Section "Overcurrent Protective Device Coordination Study acceptable fault current calculation was performed.

L. Arc Flash Warning: Electrical Equipment requiring examination, adjustment, servicing, maintenance or periodic voltage measurements shall be field marked to warn qualified personnel of potential electric arc flash hazards.

M. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Access doors and panels for concealed electrical items.
    d. Switchgear.
    e. Switchboards.
    f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    g. Substations.
    h. Emergency system boxes and enclosures.
    i. Enclosed switches.
    j. Enclosed circuit breakers.
    k. Enclosed controllers.
    l. Variable-speed controllers.
    m. Push-button stations.
    n. Power transfer equipment.
    o. Contactors.
    p. Remote-controlled switches, dimmer modules, and control devices.
    q. Battery racks.
    r. Power-generating units.
    s. Monitoring and control equipment.

t. UPS equipment.

END OF SECTION 260553

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following lighting control devices:
   1. Outdoor and indoor photoelectric switches.
   2. Indoor occupancy sensors.
   3. Outdoor motion sensors.
   4. Lighting contactors.
   5. Emergency shunt relays.
   6. Switchbox Sensors and Timers.
   7. Low voltage lighting control panels.

1.2 DEFINITIONS

A. LED: Light-emitting diode.

B. PIR: Passive infrared.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

   1. Interconnection diagrams showing field-installed wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

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.

1.5 COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Area Lighting Research, Inc.; Tyco Electronics.
2. Cooper Controls.
3. Grasslin Controls Corporation; a GE Industrial Systems Company.
4. Intermatic, Inc.
5. Lithonia Lighting; Acuity Lighting Group, Inc.
6. Novitas, Inc.
7. Paragon Electric Co.; Invensys Climate Controls.
8. Square D; Schneider Electric.
9. TORK.
10. Touch-Plate, Inc.
11. Watt Stopper (The).
12. Leviton

B. Description: Solid state, with SPST or DPST dry contacts as indicated on the Drawings or required for the application rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lx), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Surge Protection: Metal-oxide varistor, complying with IEEE C62.41.1, IEEE C62.41.2, and IEEE 62.45 for Category A1 locations.
4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

2.2 INDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allen-Bradley/Rockwell Automation.
2. Area Lighting Research, Inc.; Tyco Electronics.
3. Cooper Controls.
4. Eaton Electrical Inc; Cutler-Hammer Products.
5. Grasslin Controls Corporation; a GE Industrial Systems Company.
6. Intermatic, Inc.
7. Lithonia Lighting; Acuity Lighting Group, Inc.
8. MicroLite Lighting Control Systems.
9. Paragon Electric Co.; Invensys Climate Controls.
10. Square D; Schneider Electric.
11. TORK.
12. Touch-Plate, Inc.
13. Watt Stopper (The).
14. Leviton
15. NLight

B. Ceiling-Mounted Photoelectric Switch: Solid-state, light-level sensor unit, with separate relay unit, to detect changes in lighting levels that are perceived by the eye. Cadmium sulfide photoresistors are not acceptable.

1. Sensor Output: Contacts rated to operate the associated relay, complying with UL 773A. Sensor shall be powered from the relay unit.
2. Relay Unit: Dry contacts rated for 20A ballast load at 120- and 277-V ac, for 13A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
3. Light-Level Monitoring Range: 10 to 200 fc (108 to 2152 lx), with an adjustment for turn-on and turn-off levels within that range.
4. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with deadband adjustment.
5. Indicator: Two LEDs to indicate the beginning of on-off cycles.

C. Skylight Photoelectric Sensors: Solid-state, light-level sensor; housed in a threaded, plastic fitting for mounting under skylight, facing up at skylight; with separate relay unit mounted on luminaire, to detect changes in lighting levels that are perceived by the eye. Cadmium sulfide photoresistors are not acceptable.

1. Sensor Output: Contacts rated to operate the associated relay, complying with UL 773A. Sensor shall be powered from the relay unit.
2. Relay Unit: Dry contacts rated for 20A ballast load at 120- and 277-V ac, for 13A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
3. Light-Level Monitoring Range: 1000 to 10,000 fc (10 800 to 108 000 lx), with an adjustment for turn-on and turn-off levels within that range.
4. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with deadband adjustment.
5. Indicator: Two LEDs to indicate the beginning of on-off cycles.

2.3 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Controls.
2. Hubbell Lighting.
3. Leviton Mfg. Company Inc.
4. Lithonia Lighting; Acuity Lighting Group, Inc.
5. RAB Lighting, Inc.
6. Sensor Switch, Inc.
7. TORK.
8. Watt Stopper (The).
9. Leviton
10. NLight

B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.

1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
4. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
6. Bypass Switch: Override the on function in case of sensor failure.
7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lx); keep lighting off when selected lighting level is present.

C. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on-off functions shall be selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of

average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.

3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch high ceiling.

2.4 OUTDOOR MOTION SENSORS (PIR)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bryant Electric; a Hubbell Company.
2. Cooper Controls.
3. Hubbell Lighting.
4. Lithonia Lighting; Acuity Lighting Group, Inc.
5. Paragon Electric Co.; Invensys Climate Controls.
6. RAB Lighting, Inc.
7. TORK.
8. Watt Stopper (The).

B. Performance Requirements: Suitable for operation in ambient temperatures ranging from minus 40 to plus 130 deg F, rated as raintight according to UL 773A.

1. Operation: Turn lights on when sensing infrared energy changes between background and moving body in area of coverage; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
2. Mounting:

   a. Sensor: Suitable for mounting in any position on a standard outdoor junction box.
   b. Relay: Internally mounted in a standard weatherproof electrical enclosure.
   c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

3. Bypass Switch: Override the on function in case of sensor failure.
4. Automatic Light-Level Sensor: Adjustable from 1 to 20 fc (11 to 215 lx); keep lighting off during daylight hours.

C. 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).

D. Lighting Fixture Mounted Sensor: Suitable for switching 300 W of tungsten load at 120- or 277-V ac.

E. Individually Mounted Sensor: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.

1. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.

2. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.

2.5 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allen-Bradley/Rockwell Automation.
2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
3. Eaton Electrical Inc.; Cutler-Hammer Products.
4. GE Industrial Systems; Total Lighting Control.
5. Grasslin Controls Corporation; a GE Industrial Systems Company.
6. Hubbell Lighting.
7. Lithonia Lighting; Acuity Lighting Group, Inc.
8. MicroLite Lighting Control Systems.
9. Square D; Schneider Electric.
10. TORK.
11. Touch-Plate, Inc.
12. Watt Stopper (The).
13. Leviton

B. Description: Electrically operated and mechanically or electrically held, combination type, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as indicated on Drawings or required for the application, matching the NEMA type specified for the enclosure.

C. BAS Interface: Provide hardware interface to enable the BAS to monitor and control lighting contactors.

1. Monitoring: On-off status.
2. Control: On-off operation.

2.6 EMERGENCY SHUNT RELAY

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Controls.
2. Lighting Control and Design, Inc.
3. Wattstopper, Inc.

4. Iota

B. Description: Normally closed, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924.

1. Coil Rating: 120 or 277-volt to suit application.

2.7 SWITCHBOX SENSORS AND TIMERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Controls.
2. Hubbell Lighting.
3. Lithonia Lighting; Acuity Lighting Group, Inc.
4. Sensor Switch, Inc.
5. Watt Stopper (The).
6. NLight

B. Dual-Technology Switchbox Occupancy Sensors.

1. Description: Combination PIR and ultrasonic type with integral power-switching contacts rated for 600 W at 120-V ac, 1000 W at 277-V ac, suitable for incandescent light fixtures or fluorescent light fixtures with magnetic or electronic ballasts. LED and LED drivers.

a. Include ground wire.
b. Vandal-resistant hard lens.
c. Minimum 180-degree coverage; 300 sq. ft. at floor level; 150 sq. ft. at desk height.
d. Selectable Automatic ON or Manual ON, field set for Manual ON unless otherwise indicated.
e. Automatic Delayed OFF, adjustable over a minimum range of 1 - 30 minutes, field set for 10 minutes unless otherwise indicated; and Manual OFF.
f. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (215 to 2150 lx); keeps lighting off when selected lighting level is present (not activated unless indicated).

2. Combination PIR and microphonic.

2.8 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG.

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG.

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG.

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Electrical Specifications. Minimum conduit size shall be 3/4 inch .

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control.

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.

2. Operational Test: Verify operation of each lighting control device, and adjust time delays.

B. Lighting control devices that fail tests and inspections are defective work.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.7 DEMONSTRATION

A. Coordinate demonstration of products specified in this Section with demonstration requirements for low-voltage, programmable lighting control.

B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

C. Lighting control factory commissioning required once system is installed.

END OF SECTION 260923

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Panelboards.

1.2 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. TVSS: Transient voltage surge suppressor.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7 and Electrical Specifications.

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 units that are part of an emergency or standby power system will be fully operational after the seismic event.

1.4 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. Coordinated Layouts: Provide room or space layouts where equipment is to be installed with dimensioned plans indicating size of equipment and required clearances and service space around equipment.

C. 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.

D. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Electrical Specification Section "Electrical Supports and Seismic Restraints." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. 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.

F. Panelboard Schedules: For installation in panelboards.

G. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in General Requirements 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.

H. Trip Settings: Submit manufacturer’s literature covering the following information, as applicable, for each circuit breaker for which adjustable trip settings are required.

1. Switchboard or panelboard identification.
2. Circuit number or circuit breaker identification.
3. Size of circuit breaker – frame amps.
4. Size of rating plug – trip amps.
5. Long Time Pickup Amps – ampere rating of the plug or trip setting of the circuit breaker.
6. Long Time Delay – time dial setting in seconds.
7. Short Time Pickup – multipliers of the rating plug or actual amperes.
8. Short Time Delay - time dial setting in milliseconds.
9. Instantaneous Pickup – multipliers of the rating plug or trip setting or actual amperes.
10. Ground Fault Pickup – multipliers of a current rating indicated on the dial.
11. Ground Fault Delay - time dial setting in milliseconds.

1.5 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 may 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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.7 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.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
    b. Altitude: Not exceeding 6600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

1.8 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.

1.9 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. Keys: Six 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 Electrical Specification Section "Electrical Supports and Seismic Restraints."

B. Enclosures: Flush- and surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R.
c. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2. Front: Secured to box with concealed trim clamps. Standard hinged and locked door within front cover. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Skirt for Surface-Mounted Panelboards: Where indicated, same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
4. Gutter Extension and Barrier: Where indicated, same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
5. Finishes:

a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
b. Back Boxes: Galvanized steel where flush-mounted or surface-mounted in unfinished spaces; Same finish as panels and trim where surface-mounted in finished spaces.

6. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.

C. 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: Where indicated, adequate for branch-circuit isolated ground conductors; insulated from box.
4. Extra-Capacity Neutral Bus: Where indicated, neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
5. Split Bus: Where indicated, vertical buses divided into individual vertical sections.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
4. Feed-Through Lugs: Where indicated, mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Where indicated, mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
6. Gutter-Tap Lugs: Where indicated, mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
7. Extra-Capacity Neutral Lugs: Where indicated, rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

F. Arc Flash Warning Label: Labeled "DANGER – ARC FLASH HAZARD" with the Approach Boundary, PPE and Incident Energy Levels indicated based on the short circuit rating of the equipment.

G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

2.2 PANELBOARD SHORT-CIRCUIT RATING

A. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Series-connected ratings are not acceptable.

B. Unless otherwise indicated the minimum RMS symmetrical short circuit ratings shall be as follows:

1. Main Distribution Panels.

a. 480Y/277 volt systems; 100,000 amperes RMS symmetrical.
b. 208Y/120 volt systems; 100,000 amperes RMS symmetrical.

2. All other panelboards.

a. 480Y/277 volt systems.

1) Up to 225 amps; 65,000 amperes RMS symmetrical.
2) Over 225 amps; 100,000 amperes RMS symmetrical.

b. 208Y/120 volt systems.

1) Up to 400 amps; 65,000 amperes RMS symmetrical.
2) Over 400 amps; 100,000 amperes RMS symmetrical.

c. 208Y/120 volt systems derived from dry type step down transformers.

1) Any ampacity.

a) 6 kva - 45 kva; 10,000 amperes RMS symmetrical.
b) 75 kva - 150 kva; 22,000 amperes RMS symmetrical.
c) 225 kva - 300 kva; 42,000 amperes RMS symmetrical.
d) Above 500 kva; 100,000 amperes RMS symmetrical.

2.3 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, "Panelboards Rated 600 Volts or Less".

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: Circuit breaker or Lugs only as indicated.

E. Branch Overcurrent Protective Devices: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.4 PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.

4. Square D; a brand of Schneider Electric.
5. Other "Approved" manufacturer in accordance with Electrical Specification Section "Special Requirements".

B. Panelboards: NEMA PB 1, "Panelboards Rated 600 Volts or Less".

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: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Other "Approved" manufacturer in accordance with Electrical Specification Section "Special Requirements".

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents as indicated.

C. Generally, all molded-case circuit breakers shall be thermal-magnetic unless indicated otherwise.

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.

D. Other types of molded-case circuit breakers that may be indicated for use on this project include the following:
1. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
2. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

a. Instantaneous trip.
b. Long- and short-time pickup levels.
c. Long- and short-time time adjustments.
d. Ground-fault pickup level, time delay, and I^2t response.

3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.

4. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
5. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
6. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.

E. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
4. Ground-Fault Protection: Where indicated, Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
5. Shunt Trip: Where indicated, 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
6. Undervoltage Trip: Where indicated, set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
7. Auxiliary Contacts: Where indicated, one SPDT switch or two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
8. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
9. Key Interlock Kit: Where indicated, externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
10. Zone-Selective Interlocking: Where indicated, integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
11. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
12. Handle Padlocking Device: Where indicated, fixed attachment, for locking circuit-breaker handle in off position.
13. Handle Clamp: Where indicated; loose attachment, for holding circuit-breaker handle in on position.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to 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 NEMA PB 1.1.

B. Equipment Mounting: Install floor-mounted panelboards on concrete bases, 4-inch nominal thickness. Comply with requirements for concrete base specified in other Sections.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
2. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to panelboards.
5. Attach panelboard to the vertical finished or structural surface behind the panelboard.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

D. Comply with mounting and anchoring requirements in Specifications.

E. Mount top of trim 90 inches above finished floor unless otherwise indicated or required to maintain a maximum of 78 inches maximum to top of operating handle in any position.

F. 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.

G. Install overcurrent protective devices not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

H. Install filler plates in unused spaces.

I. Recessed Panelboards: Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.

J. Surface Mounted Panelboards: Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

K. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

L. Do not use gutter space as pull or splice boxes for foreign circuits or circuits controlled by devices external to the panelboard.

M. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Electrical Specification Section "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit 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 Electrical Specifications.

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Electrical Specifications.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more service disconnecting and overcurrent protective devices.

3.4 WARNING SIGNS

A. Arc Flash Warning Label: Labeled "DANGER – ARC FLASH HAZARD.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each 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.

3. Perform the following infrared scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of the major electrical components. Remove all panels so terminations, joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of the components after 11 months after date of Substantial Completion.
    c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    d. Record of Infrared Scanning: Prepare a certified report that identifies components checked and that describes scanning results. Include the following:

        1) Item Identification.
        2) Date.
        3) Time.
        4) Location.
        5) Equipment Identification/Description.
        6) Component Identification/Description.
        7) Color Photograph of Component.
        8) Thermal Infrared Photograph of Component.
        9) Ambient Temperature.
        10) Component Temperature, Phase I.D. and whether line or load side.
        11) Notation of and deficiencies or abnormalities, probable causes, and

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 and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Electrical Specifications.

C. 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.

3.7 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Receptacles with integral surge-suppression units.
4. Isolated-ground receptacles.
5. Tamper-resistant receptacles.
6. Weather-resistant receptacles.
7. Snap switches and wall-box dimmers.
8. Communications outlets.
9. Pendant cord-connector devices.
10. Cord and plug sets.
11. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

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.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Floor Service-Outlet Assemblies: One for every 10, of each type installed, but no fewer than one.of each type.
   2. Poke-Through, Fire-Rated Closure Plugs: One for every five floor service outlets installed, but no fewer than two.
   3. GFI Receptacles: One for every 10 of each type installed, but no fewer than two of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

   1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
   2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
   3. Leviton Mfg. Company Inc. (Leviton).
   4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

B. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2. Identification: Comply with UL requirements and bear the letters IG or the ground symbol on the face of the device so as to be visible when installed.

C. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

D. Tamper-Resistant and Weather-Resistant Convenience Receptacles: 125 V, 20A; comply with NEMA WD 1, MEMA WD 6 Configuration 5-15R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following

a. Cooper, TWRBR15.
b. Hubbell; DR15TR.
c. LevitonTRW15.
d. Pass & Seymour; TRW26252.

2. Description: Labeled to comply with NFPA 70, “Receptacles, Cord Connectors, and Attachment Plugs (Caps)”.
3. Identification: Comply with UL requirements and bear the letters TR and WR on the face of the device so as to be visible when installed.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.

3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

C. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:

D. GFCI, Tamper-Resistant and Weather-Resistant Convenience Receptables: 125 V, 20A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
1. Products: Subject to compliance with requirements, provide one of the following
   a. Cooper; TWRVGF15.
   b. Hubbell; GFTR15.
   c. Pass & Seymour; 1594TRWR.
   d. Other “Approved” manufacturer in accordance with Electrical Specifications.
2. Identification: Comply with UL requirements and bear the letters TR and WR on the face of the device so as to be visible when installed.

2.5 TVSS RECEPTACLES

A. General Description: Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 1449, and FS W-C-596, with integral TVSS in line to ground, line to neutral, and neutral to ground.

1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
2. Active TVSS Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."

B. Duplex TVSS Convenience Receptacles:

1. Description: Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.

C. Isolated-Ground, Duplex Convenience Receptacles:

1. Description:

   a. Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.
   b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.6 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.

B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:

1. Description:

    a. Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
    b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.7 PENDANT CORD-CONNECTOR DEVICES

A. Description:

1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.8 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.9 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

C. Pilot-Light Switches, 20 A:

1. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

D. Key-Operated Switches, 120/277 V, 20 A:

1. Description: Single pole, with factory-supplied key in lieu of switch handle.

E. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.

F. Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.

2.10 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable; with single-pole or three-way switching. Comply with UL 1472.

C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.

1. 600 W; dimmers shall require no derating when ganged with other devices. Illuminated when "off."

D. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.11 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Unless otherwise indicated, Smooth, high-impact thermoplastic. Color to match wiring device, unless otherwise indicated.
3. Material for Unfinished Spaces: Unless otherwise indicated, Smooth, high-impact thermoplastic. Color to match wiring device unless otherwise indicated.
4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant thermoplastic with lockable cover.

2.12 FLOOR SERVICE FITTINGS

A. Type: Unless otherwise indicated, Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular for multi-gang outlets, round for single-gang outlets; aluminum; black, gray, brass, aluminum, or ivory as indicated or directed; UL listed for scrub water exclusion.

D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: Blank cover with bushed cable opening.

2.13 POKE-THROUGH ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Pass & Seymour/Legrand.
3. Square D/Schneider Electric.
4. Thomas & Betts Corporation.
5. Wiremold/Legrand.

B. Description:

1. Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.
2. Comply with UL 514 scrub water exclusion requirements.
3. Service Outlet Assembly: Flush type with four simplex receptacles and space for four RJ-45 jacks unless indicated otherwise; cast aluminum or thermoplastic; black, gray, brass, aluminum, or ivory as indicated or directed; UL listed for scrub water exclusion.
4. Size: Selected to fit nominal 4-inch (100-mm) cored holes in floor and matched to floor thickness.
5. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
6. Closure Plug: Arranged to close unused cored openings and reestablish fire rating of floor.
7. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of four, four-pair cables.

2.14 PREFABRICATED MULTIOUTLET ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Wiremold/Legrand.
3. Other “Approved” manufacturer in accordance with Electrical Specifications.

B. Description:

1. Two-piece surface metal raceway, with factory-wired multioutlet harness.
2. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: Metal, with manufacturer's scuff coat finish.

D. Multioutlet Harness:

1. Receptacles: 15-A, 125-V, NEMA WD 6 Configuration 5-15R receptacles complying with NEMA WD 1, UL 498, and FS W-C-596.
2. Receptacle Spacing: as indicated.
3. Wiring: No. 12 AWG solid, Type THHN copper, single circuit or two circuit, connecting alternating receptacles as indicated.

2.15 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: White unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.
3. TVSS Devices: Blue.
4. Isolated-Ground Receptacles: As specified above, with orange triangle on face.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. The grounded circuit conductors, or neutral conductors, for lighting circuits being controlled by switches or dimmers shall be provided at the switch and dimmer locations and shall be connected to the appropriate terminal on the switches and dimmers if one is present.
2. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
3. 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.
4. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
5. Existing Conductors:

    a. Cut back and pigtail, or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.

3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. 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.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Electrical Specifications for identification.

B. Identify each receptacle with panelboard identification and circuit number. Use adhesive film labels on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative where appropriate:
1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display 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 unacceptable.
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. 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.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 262726

SECTION 262813 - FUSES

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 switchboards, and enclosed controllers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

    a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
    b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
3. Current-limitation curves for fuses with current-limiting characteristics.
4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
5. Coordination charts and tables and related data.
6. Fuse sizes for elevator feeders and elevator disconnect switches.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in General Requirements Specification Section "Operation and Maintenance Data," include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
4. Coordination charts and tables and related data.

1.4 MAINTENANCE MATERIAL SUMBITTALS

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 an type, but no fewer than two of each size and type.
   2. Fuse Pullers: Two for each size and type of fuse provided.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

1.6 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.

B. Where fuses are installed outdoors in full sun or in components of outdoor solar photovoltaic systems they shall be applied at the manufacturer’s temperature adjustment factors.

1.7 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. Cooper Bussmann, Inc.
   2. Mersen - Ferraz Shawmut, Inc.
   3. Other "Approved" manufacturer in accordance with Electrical Specifications.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

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. Service Entrance: Class L, time delay, 601-4000 amps; Class RK1, time delay, 600 amps and less.
2. Feeders: Class L, time delay, 601-4000 amps; Class RK1, time delay, 600 amps and less.
3. Motor Branch Circuits: Class RK1, time delay.
4. Other Branch Circuits: Class RK1, time delay.
5. Control Circuits: Class CC, fast acting.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Electrical Specification 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 262813

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following used as disconnect switches for electric services, feeders, equipment, appliances, and elsewhere as indicated.

1. Fusible switches.
2. Non-fusible switches.
3. Receptacle switches.
4. Shunt trip switches.
5. Molded-case circuit breakers (MCCBs).
6. Single-phase motor, equipment, or appliance disconnects.
7. Enclosures.

1.2 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.3 PERFORMANCE REQUIREMENTS

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 units that are part of an emergency or standby power system will be fully operational after the seismic event."

1.4 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, 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. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. 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.

F. Manufacturer's field service report.

G. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in General Requirements Specification 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.

H. Trip Settings: Submit manufacturer’s literature covering the following information, as applicable, for each circuit breaker for which adjustable trip settings are required.

1. Circuit breaker identification.
2. Size of circuit breaker – frame amps.
3. Size of rating plug – trip amps.
4. Long Time Pickup Amps – ampere rating of the plug or trip setting of the circuit breaker.
5. Long Time Delay – time dial setting in seconds.
6. Short Time Pickup – multipliers of the rating plug or actual amperes.
7. Short Time Delay - time dial setting in milliseconds.

8. Instantaneous Pickup – multipliers of the rating plug or trip setting or actual amperes.
9. Ground Fault Pickup – multipliers of a current rating indicated on the dial.
10. Ground Fault Delay - time dial setting in milliseconds.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings may indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2010 m).

1.7 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

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. Fuses: Equal to 10 percent of quantity installed for each size and type provided, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type of fuse provided.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac as required, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Where indicated or required, internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Where indicated or required, internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Auxiliary Contact Kit: Where indicated or required, One or Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
5. Lugs: Mechanical type, suitable for number, size, and conductor material.
6. Service-Rated Switches: Where indicated or required, Labeled for use as service equipment.

2.2 NON-FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac as required, 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: Where indicated or required, internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Where indicated or required, internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Auxiliary Contact Kit: Where indicated or required, One or Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
5. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 SHUNT TRIP SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussmann, Inc.
2. Ferraz Shawmut, Inc.
3. Littelfuse, Inc.
4. Other "Approved" manufacturer in accordance with Electrical Specifications.

B. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with 200-kA interrupting and short-circuit current rating when fitted with Class J fuses.

C. Switches: Three-pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

D. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, with a control power source of enough capacity to operate shunt trip, connected pilot, and indicating and control devices.

E. Accessories:

1. Oiltight key switch for key-to-test function.
2. Oiltight red ON pilot light.
3. Isolated neutral lug; 100 percent rating.
4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
5. Form C alarm contacts that change state when switch is tripped.
6. Three-pole, double-throw, fire-safety and alarm relay; 24-V dc coil voltage.
7. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. 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.

D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

E. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I^2t response.

F. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

G. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.

H. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

I. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

J. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Where indicated or required, Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.

6. Undervoltage Trip: Where indicated or required, Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
7. Auxiliary Contacts: Where indicated or required, One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.

2.5 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions of installed location and as follows.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

2.6 SINGLE PHASE DISCONNECTS

A. Horsepower rated non-fusible wiring devices used as disconnect switches for 120 volt line to neutral loads.

B. Device plate suitable for padlocking.

2.7 IDENTIFICATION

A. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

2.8 WARNING SIGNS

A. Arc Flash Warning Label

PART 3 - EXECUTION

3.1 GENERAL

A. Provide disconnecting means for each appliance, heating or ventilating equipment, motor and controller, air-conditioning or refrigeration equipment, as indicated, and where required by applicable codes.

3.2 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in Electrical Specification Section "Electrical Supports and Seismic Restraints."

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NECA 1.

3.4 IDENTIFICATION

A. Comply with requirements in Electrical Specifications.

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of the major electrical components. Remove all panels so terminations, joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of the components after 11 months after date of Substantial Completion.
c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
d. Record of Infrared Scanning: Prepare a certified report that identifies components checked and that describes scanning results. Include the following:

1) Item Identification.
2) Date.
3) Time.
4) Location.
5) Equipment Identification/Description.
6) Component Identification/Description.
7) Color Photograph of Component.
8) Thermal Infrared Photograph of Component.
9) Ambient Temperature.
10) Component Temperature, Phase I.D. and whether line or load side.
11) Notation of and deficiencies or abnormalities, probable causes, and recommendations.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Electrical Specifications.

END OF SECTION 262816

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior solid-state luminaires that use LED technology.
2. Lighting fixture supports.

1.2 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index. Minimum 80 CRI

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

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 emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project IES LM-79 and IES LM-80.

    a. Manufacturers' Certified Data: Photometric data certified by 3rd party laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lighting luminaires.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
4. Structural members to which equipment and or luminaires will be attached.
5. Initial access modules for acoustical tile, including size and locations.
6. Items penetrating finished ceiling, including the following:

    a. Other luminaires.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Ceiling-mounted projectors.

7. Moldings.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

D. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Product Certificates: For each type of luminaire.

F. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

G. Sample warranty.

1.5 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.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type (including door frames if required)
3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.
4. LED Boards 1 for every 100 of each type. Minimum of 1 per type.
5. LED Drivers 1 for every 100 of each type Minimum of 1 per type.

1.7 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a 2.5 Step MacAdam Ellipse to ensure color consistency among luminaires.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. Recessed Fixtures: Comply with NEMA LE 4.

D. Bulb shape complying with ANSI C79.1.

E. Lamp base complying with ANSI C81.61 or IEC 60061-1.

F. CRI of 85. CCT of 3500 K.

G. Rated lamp life of 50,000 hours.

H. Lamps dimmable from 100 percent to 1 percent of maximum light output.

I. Internal driver. 0-10V pref.

J. Nominal Operating Voltage: 120 V ac/ 277 V ac.

1. Minimum Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

2.3 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. 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.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI for all luminaires.

2.4 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.5 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 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 fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Remote Mounting of Ballasts: Distance between the ballast and fixture shall not exceed that recommended by ballast manufacturer. Verify, with ballast manufacturers, maximum distance between ballast and luminaire.

D. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.

1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches (150 mm) from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

E. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

F. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.

G. Tube Guards:

1. Provide slip-on clear plastic tube guards on unprotected fluorescent lamps.
2. Install tube guards according to manufacturer’s instructions.
3. Check that guards do not extend over the contact pins or screw shell.
4. Verify that socket pins and screw shells are properly seated. Do not rely on the guards to turn or insert the lamp, visually inspect each installation to verify proper lamp installation.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265119

SECTION 310513-SOILS FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Subsoil materials.
   2. Topsoil materials.

B. Related Sections:

   1. Section 312213 - Rough Grading.
   2. Section 312317 - Trenching.
   3. Section 329119 - Landscape Grading.

1.2 UNIT PRICES - MEASUREMENT AND PAYMENT- NOT USED

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

C. NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

1.4 SUBMITTALS

A. Materials Source: Submit name of imported materials source and provide a “clean fill” certification.

B. Manufacturer's Certificate: Certify structural fill meets or exceeds gradation envelope.

C. For the soil planting bed mix of the Rain Garden, certification that the fill meets or exceeds the permeability limitations as specified on the project drawings.

1.5 QUALITY ASSURANCE

A. Furnish each subsoil and topsoil material from single source throughout the Work.

B. Perform Work in accordance with NJDOT standards

PART 2 PRODUCTS

2.1 SUBSOIL MATERIALS

2.2 SUBSOIL MATERIALS

A. General Fill shall conform with Section 203 Embankment of the NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

B. General Fill Material shall be of a maximum size that can readily be placed in loose 8-inch layers.
   1. Gradation – More than 35% passing No. 200 sieve
   2. Minimum dry mass density – 95 lbs per cubic feet determined according to PTM No. 106, Method B.
   3. Maximum liquid limit -65, determined according to AASHTO 89
   4. Plasticity Index – Not less than liquid limit minus 30, determined according to AASHTO T90 for soils with liquid limits of 41 to 65.

2.3 STRUCTURAL FILL MATERIALS

A. Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand free of all organic material and contaminants, with a maximum particle size of 3 inches, between 10 and 70 percent by weight passing the U.S. Standard No. 40 sieve and containing no more than 12 percent by weight passing the U.S. Standard No. 200 sieve. Recycled concrete is considered suitable for use as engineered fill when approved by Geotechnical Engineer. Imported fill material shall be approved by Geotechnical Engineer well in advance of fill construction.

B. Structural fill shall be compacted to at least 95 percent of the laboratory determined dry density per ASTM D1557 for footings, slab on grade and pavements.

2.4 TOPSOIL MATERIALS

A. Topsoil: Conforming to NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended, Section 804.

2.5 GRANULAR FILL

A. AASHTO Size #57 stone in accordance with the gradation set forth in NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

2.6 SOURCE QUALITY CONTROL

A. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D1557.

B. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D698.

C. When tests indicate materials do not meet specified requirements, change material and retest.

D. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 EXCAVATION

A. Excavate subsoil and topsoil to achieved desired grades. Strip topsoil to full depth of topsoil in designated areas.

B. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials separately.

C. Remove excess excavated materials not intended for reuse, from site.

D. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from site.

3.2 STOCKPILING

A. Stockpile materials on site at locations indicated on drawings.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Prevent intermixing of soil types or contamination.

E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

F. Stockpile unsuitable materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION 310513

SECTION 311000-SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and all Divisions of these Specifications apply to this section.

1.2 DESCRIPTION OF WORK

A. Provide all materials, labor and equipment required for the execution of all clearing, grubbing and site preparation and related work in accordance with the Drawings, schedules and this Specification, including, but not necessarily limited to the following:

(1) Soil erosion and sediment control.
(2) Stripping and stockpiling all available top-soil for re-use as part of Site Improvements and Planting.
(3) Removal of trees and/or vegetation, and protection of trees and shrubs which are shown to be retained.
(4) Layout for all temporary access areas and storage areas.
(5) General preparation of the site for excavating, filling and backfilling.
(6) Removal of all excess rubbish, debris, unsuitable material, etc.
(7) Disposal off-site, legally.
(8) Stake out of all new work by licensed Land Surveyor.
(9) Contractor to verify location of all utilities.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 31 20 00, Earth Moving
B. Section 32 13 13, Concrete Paving

1.4 UNIT PRICE - MEASUREMENT AND PAYMENT – NOT USE

1.5 JOB CONDITIONS

a. Protection of Existing Improvements

i. Provide protection necessary to prevent damage to existing improvements indicated to remain in place.

ii. Protect improvements on adjoining properties and on the Owner's property.

iii. Restore damaged improvements to their original condition, as acceptable to parties having jurisdiction.

B. Protection of Existing Trees and Vegetation:

(1) Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking, or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within 4' of drip line, excess foot or vehicular traffic, or parking of vehicle within 4' of drip line. Provide temporary snow fencing or armoring to protect trees and vegetation to be left standing during construction operations. Such protection shall be placed before any excavation or grading is begun, and shall be maintained and remain until the landscape planting work is started and then removed.

(a) Existing trees and groups of shrubs in the construction area shall be fenced around their outer perimeter (drip line of the trees) in the following manner: Fences shall be standard 48" high snow fence mounted on standard steel posts not greater than 6' apart.

(b) Existing individual trees near heavy construction traffic shall be armored in the following manner: Trunks shall be wrapped with burlap and 2" x 4" planks wired vertically as armor around trunks, and spaced no greater than 2" apart to 5' above ground.

(c) All other trees in groups, near construction traffic, on the property to be preserved shall be protected by fencing in the following manner: Fences shall have posts equivalent to 4" x 4" set 3' in the ground and 5' above the ground, not over 8' on center. Provide 2 walers equivalent to 2" x 6" and vertical 1" x 6" boards not over 1'-6" apart or plywood fencing.

(2) Water trees and other vegetation to remain within the limits of the contract work as required to maintain their health during the course of construction operations.

(3) Provide protection for roots over 1-1/2" diameter cut during construction operations. Coat the cut faces with emulsified asphalt, or other coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

(4) Repair or replace trees and vegetation damaged by construction operations. Repairing of damage to tree crowns or root systems shall be performed by a qualified Landscape Architect.

(5) Replace trees which cannot be repaired and restored to full growth status.

C. Soil erosion and sediment control shall include the furnishing of all materials, labor, and equipment necessary for implementing proper measures to reasonably control soil erosion from construction operations and prevent excessive flow of sediment from the construction site. Such work may include the installation of water diversion structures, diversion ditches and sediment basins, silt fence, inlet filters, seeding and mulching and

sodding critical areas to provide temporary protection. All work shall be performed in accordance with the approved soil erosion plan and details.

D. Protection of water migration into construction pad and excavations.

1.6 QUALITY ASSURANCE

A. Materials shall conform to the requirements of appropriate articles of "Standard for Soil Erosion and Sediment Control in New Jersey" as revised and adopted January 2014, and the Standard Specification for Road and Bridge Construction of the New Jersey Department of Transportation, 2007, as added to and amended. Such standard specifications are made part of the specifications by this reference and will not be repeated herein. In case of conflict between the above-mentioned requirements, the standard requiring the higher in terms of quality of materials and workmanship shall prevail.

PART 2 - EXECUTION

2.1 SOIL EROSION AND SEDIMENT CONTROL

A. All soil erosion and sediment control practices on this project shall be constructed in accordance with the "Standards for Soil Erosion and Sediment Control in New Jersey", or as approved for this project. The smallest practicable area of land shall be exposed at any one time during the project and wherever feasible, natural vegetation shall be retained and protected. Stripping of vegetation, grading or other soil disturbance shall be done in a manner which will minimize soil erosion.

B. A schedule of construction operations shall be submitted to the Engineer for his approval. A 72 hour notice shall be given to the Engineer prior to the start of construction or grading. This notice can be verbal but must be followed by a written statement not less then forty-eight (48) hours prior to start-up.

C. All soil erosion and sediment control devices shall be in place prior to any major soil disturbance or installed and removed in their proper sequence to allow for further operations on the site. All sediment control structures shall be checked and maintained on a regular basis and all basins shall be cleaned periodically when storage capacity is affected by siltation. During construction, any additional control measures as deemed necessary to prevent erosion or control sediment beyond those measures shown on the approved plans shall be installed or employed at the direction of the Engineer. After completion of construction, soil and sediment controls shall be left in place until all disturbed areas are stabilized.

D. Disturbed areas including roadway embankments shall be maintained in a rough graded condition and temporarily seeded and/or mulched until proper weather conditions exist for the establishment of permanent vegetative cover. All areas disturbed by grading on which permanent or semi-permanent seeding or temporary seeding have not been made,

and all slopes with a grade steeper than 2:1, shall be treated by mulching. The mulch shall be applied at a rate of 2 tons per acre or equivalent measure, according to State standards. All areas disturbed by grading including soil stockpiles, which will not be used or constructed upon a period greater than thirty (30) days shall be temporarily seeded and protected as required. All areas disturbed by grading which will not be constructed upon with six (6) months are to be stabilized with a permanent type seeding and fertilizing. All disturbed areas shall be topsoiled, limed and fertilized prior to both temporary and permanent seeding in conformance with charts and tables as set forth in the "Standards for Soil Erosion and Sediment Control in New Jersey".

E. Access and haul roads shall be protected with stone access strips and coarse stone filters in appropriate locations.

F. Fording of streams shall be kept to a minimum and where frequent crossings are contemplated, temporary bridges or culverts shall be constructed.

G. Storm drainage inlets are to be either capped or protected by temporary filter devices to prevent the entry of sediment carried by runoff water until vegetation and/or paving is established as planned.

H. Wherever well points, pumps or other dewatering methods are used, care shall be taken to provide for the elimination of said dewatering.

I. All drainage swales shall be parabolic in shape unless otherwise noted and shall conform to SCS design and standards. Drainage swales and other structures shall be located in the field so as to retain as much of the original vegetation as possible, especially large trees.

J. Roadways shall be swept at the end of each working day by the Contractor. When deemed necessary by the Engineer, the Contractor shall have the roadways swept by a mechanical sweeper. Same shall be provided at no additional cost to the owner.

K. Washdown shall be provided.

2.2 CLEARING AND GRUBBING

A. Cut down and cut up all trees, shrubs, brush, rubbish and debris projecting above ground in the site limit area except those indicated to remain. Grub or root out all stumps, roots, matted roots, and underground grass or weeds, and similar refuse underground not suitable for compaction to a depth of 18" below subgrade.

B. Use only hand methods for grubbing inside the drip line of trees indicated to be left standing.

C. Fill and compact depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

D. Place fill material in horizontal layers not exceeding 8" loose depth, and thoroughly compact to a density equal to adjacent original ground, or as otherwise required.

2.4 STRIPPING TOPSOIL

A. Prior to stripping of onsite topsoil for stockpiling, the topsoil shall be tested and an estimate of the onsite volume determined. The quantity of additional topsoil as required for the project shall be determined by the Landscape Contractor and submitted to the Landscape Architect for approval.

B. Remove topsoil to its full depth. Screen material removed to be free of clay, debris, or other foreign matter. Stockpile as noted on site plans ready for re-use as required for seeding and planting. Determine amount of topsoil so required and remove all excess topsoil from the site; and dispose of in a legal manner or as requested by Owner. Construct stockpiles to freely drain surface water. Cover stockpiles, if required, to prevent wind blown dust. Protect topsoil from erosion. Submit estimated amount of topsoil to be stockpiled to the Landscape Architect.

2.5 DISPOSAL OF EXCESS MATERIAL

A. Remove all excess cleared material from the building site. Break-up concrete and pavement debris and otherwise process material to sizes suitable for landfill as directed. Under local regulations absolutely no burning of material will be allowed on the site. Obtain all required permits and authorizations for transportation/disposal of excess material.

B. Excess material shall be disposed of in accordance with Subsections 201.03 and 202.03 of the NJDOT 2007 Standard Specifications for Road and Bridge Construction.

END OF SECTION 311000

SECTION 312000-EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and all Divisions of these Specifications apply to this section.

1.2 DESCRIPTION OF WORK

A. Provide all materials, labor and equipment required for the execution of all excavating, filling and backfilling and related work shown on the Drawings and/or specified herein.

B. The work includes, but is not necessarily limited to, the following:

(1) Earthwork, excavating, filling and all compaction in accordance with these specifications.
(2) Excavating, filling and backfilling for all site walls.
(3) Excavating, filling and backfilling for curbs, sidewalks and pavements.
(4) All excavating, backfilling and compacting for all storm drainage, sanitary sewers, electrical, and water outside the building, on the site and including work for connection of building services to municipal and/or utility company services.
(5) Rough grading of site to proposed subgrade for seeded areas, walks, curbs, and pavements.
(6) Finish grading of all unseeded or unpaved portions of site.
(7) All pumping, shoring and protection of executed work.
(8) Clean subgrade of all debris and stone over 2" in diameter. Subgrade must be approved by the Engineer or Landscape Architect prior to spreading of topsoil.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 31 10 00, Site Clearing
B. Section 32 13 13, Concrete Paving

1.4 UNIT PRICE - MEASUREMENT AND PAYMENT – NOT USED

1.5 JOB CONDITIONS

A. Existing Utilities: Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.

Information as to the location of existing utilities has been collected from various sources. The result of such investigations are shown on the contract drawings but are not guaranteed as to accuracy. The contractor is particularly directed to the fact that

underground object or material location, elevation, or type is not guaranteed to be correct (nor can they be assumed to be the only subsurface objects or materials which may be encountered in the work). The Contractor shall make all necessary investigations to satisfy himself as to the existing conditions prior to bidding the work.

Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of the utility owner.

Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when permitted in writing by owners representative and then only after acceptable temporary utility services have been provided.

Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

In case water, gas pipes, conduits, or other utilities become broken in the prosecution of the work, the Contractor shall give immediate notice to the proper authorities and shall be responsible for all damage to persons or property caused by such breaks. Failure to give prompt notice to the authorities shall make the Contractor responsible for any needless loss of water or gas, or from interruption of services.

B. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights. Operate warning lights as recommended by authorities having jurisdiction.

NOTE: No additional compensation will be provided for importing or exporting material.

1.6 QUALITY ASSURANCE

A. Conform to applicable environmental requirements, including the disposal of debris, the use of herbicides and erosion control.

B. Perform Work in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

1.7 SUBMITTALS

a. Submit the following data to the Engineer for review:

i. Test report(s) on borrow material (ASTM D 2487) - 3 copies, each report.

ii. Field density test reports (ASTM D 1557) - 3 copies, each report.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Compacted Structural Fill and Backfill: Materials shall consist of dry compactable portions of the excavated site soils approved for reuse that are free of organic matter, rubble and all deleterious substances. Additional compacted fill and backfill that may be required (borrow material) shall consist of imported, clean, relatively well-graded granular soils free of all organic material and contaminates, with a maximum particle size of 3 inches, between 10 and 70 percent by weight passing the U.S. Standard No. 40 sieve and containing no more than 12 percent by weight passing the U.S. Standard No. 200 sieve.

B. General Fill: Materials shall consist of soils free of deleterious substances with a maximum particle size of 3 inches and no more than 20 percent by weight passing the U.S. Standard No. 200 sieve size, which can be spread to achieve the desired grades, and be sufficiently compacted to support the construction equipment, its own weight and the desired construction.

2.2 ACCEPTANCE OF MATERIALS

A. The Owner shall employ a qualified testing service (Soils Engineer) to perform the required field density tests. The Contractor shall submit to the Soils Engineer the required data for the compacted fill or backfill subject to testing and inspection. The materials shall not be used until accepted by the Soils Engineer. By submitting the data, the Contractor agrees that the fill materials used for construction will conform with the Specifications. Final acceptance of fill materials rests with the Soils Engineer and Owner whose decision shall be final and binding upon the Contractor. However, the acceptance of any materials by the Engineer shall not relieve the Contractor of his responsibility to ensure that the materials used conform with the data submitted and these Specifications.

B. For excavation and compaction of area outside of the building construction including lawns, sidewalks and parking areas, the civil engineer may review and approve the work.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavate all work accurately to levels and depths required. Trim all bottoms of excavation level and tamp and roll all footing beds to ensure necessary bearing capacity. Remove existing material to depths required and to existing utilities shown.

B. If existing fill materials and/or organic soils cannot be relied upon to provide adequate support for the foundations or floor slabs of the proposed building. The materials must be removed from within and at least five feet beyond the limits of the proposed building area, and be replaced with controlled compacted structural fill.

C. Classifications: All excavation shall be unclassified, and include removal and disposal of pavements and other obstructions, underground structures and utilities indicated to be demolished and removed, and all other materials encountered.

F. Unauthorized Excavation: Consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Architect/Engineer. Unauthorized excavation, as well as remedial work directed by Architect/Engineer shall be at Contractor's expense.

Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Soils Engineer.

Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Soils Engineer.

F. Additional Excavation: When excavation has reached required subgrade elevations, notify Soils Engineer who will make an inspection of conditions.

If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by the Soils Engineer.

G. Stability of Excavations: Excavation side slopes are to comply with local ordinances having jurisdiction as well as all applicable state and federal requirements including Occupational Safety and Health Act (OSHA) Standards. Maintain sides and slopes of excavations in safe condition until completion of backfilling. Provide shoring and bracing where allowable excavation side slopes cannot be maintained because of space restrictions or stability of material excavated.

3.2 COMPACTION REQUIREMENTS

A. Compact each layer of fill or backfill beneath the building slab, foundations, walkways, curbs, pavements and other improved areas to at least 95 percent of its maximum dry density as determined by the ASTM D-1557 test procedure. Finish landscaped or unimproved areas, compact each layer of fill or backfill to at least 90 percent of its maximum dry density (determined by the same test criteria). Fill shall be compacted in 8” lifts when using a vibratory roller or rammer (jumping jack). Plate tampers are not acceptable.

B. Porous Fill: Unless otherwise shown, the top 6 inches of fill under slabs on grade shall be 3/4" crushed stone or bank run gravel and shall be compacted using mechanical tampers.

3.3 FIELD QUALITY CONTROL

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

B. Inspection Service:

The Owner shall employ a qualified testing service (Soils Engineer) to inspect the critical earthwork operations, if required.

When approval by the soils engineer is required, the contractor shall provide adequate notice to allow the soils engineer to observe the items in question. For site inspection, a minimum of 24 hours notice will be required.

Approval by the soils engineer shall mean that at the time the soils engineer knows of no reason for objecting thereto. The soils engineer's approval shall not relieve the contractor from his full responsibility for the accurate and complete performance of the work, in accordance with the contract drawings and specifications.

The soils engineer will provide daily field reports to the contractor and owner summarizing the work completed that day. Any insufficient work observed by the soils engineer will be recorded and brought to the contractor’s attention as soon as possible.

C. Grading Tolerances:

(1) Lawn or unpaved areas: Plus or minus one inch.

(2) Pavements, walkways, concrete slabs and foundations: Plus or minus ½ inch.

3.4 DEWATERING

A. Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.

B. The Contractor shall dewater the excavations promptly and continuously throughout the progress of the work and shall keep the excavations dry at all times until the structures to be built therein are completed. Where work is to be performed below the groundwater level, the Contractor shall provide, operate, and maintain dewatering facilities including pumps, well points, sumps, suction and discharge lines and other dewatering system components sufficient to maintain the excavation free from groundwater for the time required to complete the work in the proper manner.

C. The Contractor shall protect uncompleted work from flooding during storms or from other causes. All pipelines or structures not stable against uplift during construction or prior to completion shall be thoroughly braced or otherwise protected.

D. All necessary precautions shall be taken to prevent disturbance of, and to properly drain, the areas upon which concrete is to be poured, and upon which pipe is to be laid. All

concrete shall be kept dry for as long as it takes the concrete to acquire satisfactory strength. Pipes shall not be laid under water.

E. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings and soil changes detrimental to stability of subgrade and foundations.

F. Convey water removed from excavations and rain water to collecting or runoff areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.

3.5 SHORING AND BRACING

A. Furnish design of, provide materials for, and install shoring and bracing, such as sheet piling, uprights, stringers, and cross-braces, in good serviceable condition.

B. Establish requirements for trench shoring and bracing to comply with appropriate codes and authorities having jurisdiction.

C. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

D. Where may be required, provide permanent steel sheet piling or pressure creosoted timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures. Cut off tops as required and leave permanently in place.

3.6 EXCAVATING AND FILLING BELOW SLAB ON GROUND AND FOUNDATIONS

A. The Owner shall employ a qualified Soils Engineer acceptable to observe the critical earthwork operations and perform the necessary soils testing.

B. If, in the opinion of the Soils Engineer, based on his inspection or test reports submitted by the Contractor for review, subgrades or fills which have been placed are below specified density, provide additional compaction and testing at no additional expense to Owner.

C. Any existing organic, unstable fill and other unsuitable material encountered shall be excavated to the depth and extent as required and shall be removed from the site and legally disposed of off-site prior to commencement of compacting the existing subgrades. The Contractor shall obtain all necessary permits to remove and dispose of unsuitable materials.

D. Additional Excavation: When excavation has reached the required subgrade elevations, notify Soils Engineer who will observe the exposed subgrade conditions.

(1) If, in the opinion of the Soils Engineer, unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material with controlled compacted fill as specified herein.

(2) Removal of unsuitable material and its replacement as directed is to be included in the basic contract conditions and will not be considered as changes in work.

E. The compaction of exposed subgrade soils (after removal of the unsuitable fill materials) shall be performed with a vibrator compactor or rammer (jumping jack); plate tampers are not acceptable. At the option of the Owner, the Contractor may be asked to leave the subgrade uncompacted.

F. Fill shall extend a minimum of five feet beyond the outside face of foundation wall and shall then slope down at the rate of l.5 horizontal to l.0 vertical to meet the existing subgrade.

G. The fill shall be spread evenly by mechanical equipment or by manual means above the approved (compacted) subgrade and shall be mixed thoroughly and spread in lifts not exceeding 8 inches, and shall be built up in horizontal layers as nearly even as practicable to prevent the thickness of lift from exceeding that specified. Each lift shall be compacted to develop at least 95 percent of maximum dry density as defined by ASTM D-l557 test procedure. The degree of compaction shall be checked and each successive lift shall not be placed or compacted until the previous lift is tested and results thereof accepted by the Owner. The fill slopes shall at all times be accepted by the Contractor. Proof rolling shall be performed prior to placement of any site fills in accordance with the specifications and project Geotechnical Engineering Report.

H. No fill materials shall be placed when either the fill materials of the previous lift (or subgrade) on which it is placed, contains standing water, mud, snow, ice or frozen material. In the event that any fill which has already been placed or the subgrade shall become wet, muddy, or frozen, it shall be scarified and recompacted or removed before the next lift is placed. Any soft spots shall be removed or recompacted before new fill material is placed.

I. Top of fill shall be the subgrade for porous fill, where applicable.

J. Puddling or jetting shall not be permitted.

3.7 FILL AND BACKFILL FOR MECHANICAL INSTALLATIONS

A. Mechanical installations shall be placed upon 6 inches of hand placed and tamped backfill shaped to the contour of the pipe. Keep fill on both sides of pipe at equal heights. Handfill and tamp to two feet above pipe. Machine backfill and compaction permitted for balance of fill. All fill shall be as specified herein approved and shall be free from stone.

3.8 STOCK PILING, EXCESS MATERIAL

A. Stockpile all suitable excavated material during construction without inter-mixing unlike material as directed by the Engineer, conveniently placed for re-use as required by backfilling or filling. Place, grade and shape stockpiles to drain surface water. Cover to prevent wind blown dust and exposure to excessive moisture.

B. Stockpile soil materials away from the edge of excavations. Do not store within drip lines of remaining trees.

C. Remove all excess material from site. Remove and legally dispose of, surplus soil, waste materials, trash and debris from the site.

3.9 EXPLOSIVES

A. Explosives shall not be brought to or used at the project site without written consent of the Owner and authorities having jurisdiction.

3.10 PROTECTION OF EXISTING UTILITIES

A. Existing Utilities: Contractor shall locate existing underground utilities in areas of work. If utilities are to remain in-place, provide adequate means of protection during earthwork operations.

B. Information as to the approximate location of existing utilities has been collected for design purposes from various sources. The result of such investigations are shown on the Drawings but are not guaranteed as to accuracy. The Contractor is particularly directed to the fact that underground object or material location, elevation, or type is not guaranteed to be correct (nor can they be assumed to be the only subsurface objects or materials which may be encountered in the work). The Contractor shall make all necessary investigations to satisfy himself as to the existing conditions prior to bidding the work.

C. Should uncharted, or incorrectly chartered piping or other utilities be encountered during excavation, consult utility Owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of the utility Owner.

D. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by Owner's representatives and then only after acceptable temporary utility services have been provided.

E. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

F. In case water, gas pipes, conduits or other utilities become broken in the execution of the work, the Contractor shall give immediate notice to the proper authorities and shall be responsible for all damage to persons or property caused by such breaks. Failure to give

prompt notice to the authorities shall make the Contractor responsible for any needless loss of water or gas, or for interruption of services.

3.11 MAINTENANCE

A. Repair and re-establish grades in settled, eroded and rutted areas to specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape and compact to required density prior for further construction.

END OF SECTION 312000

SECTION 312213-ROUGH GRADING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating topsoil.
2. Excavating subsoil.
3. Cutting, grading, filling, rough contouring, compacting site for site structures and building pads.

B. Related Sections:
1. Section 311000 - Site Clearing:
2. Section 312316 - Excavation:
3. Section 312317 - Trenching:
4. Section 329119 - Landscape Grading:

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT – NOT USED

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
4. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
6. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
7. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).
8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

C. NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

1.4 SUBMITTALS – NOT USED

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

B. Perform Work in accordance with Section 312316

C. Perform Work in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey.

PART 2 PRODUCTS

2.1 MATERIALS- As specified in Section 310513.

2.2 EXAMINATION

A. Verify site conditions

B. Verify survey bench mark and intended elevations for the Work are as indicated on Drawings.

2.3 PREPARATION

A. Call NJ One Call not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum.

C. Notify utility company to remove and relocate utilities.

D. Protect utilities indicated to remain from damage.

E. Protect plant life, lawns, rock outcropping and other features remaining as portion of final landscaping.

F. Protect bench marks, survey control point, existing structures to remain including but not limited to fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

2.4 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be further excavated, re-landscaped, or re-graded.

B. Excavate and process wet material to obtain optimum moisture content.

C. When excavating through roots, perform Work by hand and cut roots with sharp axe.

D. Remove excess subsoil not intended for reuse, from site.

E. Benching Slopes: Horizontally bench existing slopes greater than 1: 4 to key placed fill material to slope to provide firm bearing.

F. Stability: Replace damaged or displaced subsoil as specified for fill.

2.5 FILLING

A. Fill areas to contours and elevations with approved materials free of excessive moisture and frozen material.

B. Place fill material in continuous layers and compact in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended, Section 203 for landscaped areas and Section 301 for all other areas.

C. Maintain optimum moisture content of fill materials within ±2 percent to attain required compaction density.

D. Slope grade away from building as shown on the drawings.

E. Make grade changes gradual. Blend slope into level areas.

F. Repair or replace items indicated to remain damaged by excavation or filling.

2.6 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

END OF SECTION 312213

SECTION 312316-EXCAVATION

PART 1 GENERAL

1.1 STIPULATIONS

A. Excavation for this Project shall be considered unclassified and shall include all types of earth and soil, any pebbles, boulders, and bedrock, municipal trash, rubbish and garbage and all types of debris of the construction industry such as wood, stone, concrete, plaster, brick, mortar, steel and iron shapes, pipe, wire, asphaltic materials, paper and glass. Unclassified excavation does not include unforeseen concrete foundations, walls, or slabs. All such materials encountered which are identified by this paragraph as unclassified shall be removed to the required widths and depths to create a finished product as shown and/or noted on the drawings and as written in the specifications. No additional compensation shall be made to the contractor for this unclassified excavation. The materials defined by this paragraph as unclassified will not be considered to be concealed conditions or unknown physical conditions below the surface of the ground for purposes of interpreting the language in the General Conditions of the Construction Contract.

B. Any available data concerning subsurface materials or conditions based on soundings, test pits or test borings, has been obtained by the Owner for its own use in designing this Project. The Test Boring logs are for informational/guidance purposes only; it is not to be relied on by prospective Bidders.

1.2 SUMMARY

A. Section Includes:
   1. Excavating for paving, sidewalks and paver areas.
   2. Excavating for foundations and slabs-on-grade.

B. Related Sections:
   1. Section 312213 - Rough Grading.
   2. Section 312317 - Trenching:

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT- NOT USED

1.4 REFERENCES

A. Local utility standards when working within 24 inches of utility lines.

B. NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.1 PREPARATION

A. Call NJ One Call not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum.

C. Perform Test Pits as necessary to determine the location and depth of the sanitary septic system and piping within the limits of the project.

3.2 EXCAVATION

A. Excavate subsoil to accommodate building foundations, slabs-on-grade, paving and site structures and construction operations to the required depth as shown on the plans.

B. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity.

C. Slope banks with machine to angle of repose or less until shored.

D. Do not interfere with 45 degree bearing splay of foundations.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation.

F. Trim excavation. Remove loose matter.

G. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd. measured by volume.

H. Notify Architect/Engineer of unexpected subsurface conditions.

I. Correct areas over excavated with structural fill as directed by Geotechnical Engineer.

J. Remove excess and unsuitable material from site.

K. Stockpile excavated material in area designated on site.

L. Repair or replace items indicated to remain damaged by excavation.

3.3 FIELD QUALITY CONTROL

A. Approval of Bearing Strata

1. The Contractor shall furnish adequate advance notification to the Architect/Engineer of times when footing excavations are to be completed, so that the bearing quality of bottoms may be inspected and/or tested and approved. Formwork, reinforcing steel and concreting shall follow only after this approval.
2. Should the bearing at the levels indicated be found by the Architect/Engineer and the Department to be inadequate, they may order the excavation carried down to sound bearing. Such excavation shall be classed as additional work and payment be made on the basis of an agreed price according to the General Conditions. Should suitable bearing be found at a lesser depth than indicated, the Architect/Engineer and the Department may order the reduction of excavation specified or shown on the drawings, and the Contractor shall allow a credit for excavation thus omitted on the same basis.
3. Request inspection of excavation and controlled fill operations in accordance with applicable code.

B. Quality Control Testing
1. The Contractor shall perform all necessary Quality Control tests and procedures for the performance of the work in accordance with Section 014000 and this section, to produce end results specified. The Contractor shall maintain clear and orderly records of such tests and procedures and make them available for field review and approval of the Professional. The Contractor's bid shall include the cost of all Quality Control Tests.
2. The Contractor shall submit its plan for Quality Control testing to the Professional for review and comments.
3. Quality Control tests shall include tests on fill material, optimum moisture content and maximum density and field density tests of fill layers. The QC Testing agent shall comment on the suitability of all subgrades, and the subgrades shall be acceptable to the QA Agency.
4. Handwritten copies of field test reports shall be provided to the Contractor. They shall be given to the Contractor and inspector within two (2) hours of completion, but in no event shall the technician leave the site without providing the Contractor and inspector with a copy of the test results. This shall include density, % moisture, plan location, elevation, comments and any other relevant data. Comments shall include any condition that might have an adverse effect on the operations, including weather, drainage, etc.
5. The Contractor shall request consultation with the Consulting Geotechnical Engineer on any problems that arise during construction. Copies of the daily in-place soil density tests shall be faxed to the consultant by the Contractor through the testing agency within twenty-four (24) hours of the time the tests are made.
6. The Contractor shall approve each subgrade and each fill layer before proceeding to the next layer. Any area which does not meet density, % moisture or other requirements at any time, shall be suitably reworked and retested by the Contractor at his own expense.

3.4 The Professional and/or the Owner may perform Quality Assurance tests as deemed necessary for the assurance of the Professional and/or the Owner. This does not relieve the Contractor of his responsibilities.

3.5 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

C. Prevent excavations from accumulating water and protect excavations from weather.

D. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION 312316

SECTION 312317-TRENCHING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating trenches for utilities from 5 feet outside building to utility service.
2. Compacted fill from top of utility bedding to subgrade elevations.
3. Backfilling and compaction.

B. Related Sections:
1. Section 31 22 13 - Rough Grading:
2. Section 31 23 16 - Excavation:

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

1.4 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

1.5 QUALIFICATIONS

A. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of New Jersey.

1.6 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication of any sheeting or shoring system.

1.7 COORDINATION

A. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. General Fill: As specified in Section 31 05 13

B. Structural Fill: As specified in Section 31 05 13

PART 3 EXECUTION

3.1 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.
   1. Architect/Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.2 PREPARATION

A. Call NJ One Call not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life, lawns, rock outcropping and other features remaining as portion of final landscaping.

D. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Maintain and protect above and below grade utilities indicated to remain.

F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.3 TRENCHING

A. All work shall be performed in accordance with OSHA regulations. OSHA regulations shall govern, should there be a question or discrepancy between their regulations and these specifications.

B. Excavate subsoil required for utilities to utility service.

C. Perform excavation within 24 inches of existing utility service in accordance with utility's requirements.

D. Do not advance open trench more than 200 feet ahead of installed pipe.

E. Cut trenches to width indicated on Drawings. Remove water or materials that interfere with Work.

F. Excavate bottom of trenches maximum 2 feet wider than outside diameter of pipe.

G. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe.

H. Do not interfere with 45 degree bearing splay of foundations.

I. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this section.

J. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by Geotechnical Engineer until suitable material is encountered.

K. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Structural Fill and compact to density equal to or greater than requirements for subsequent backfill material.

L. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

M. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Engineer.

N. Remove excess subsoil not intended for reuse, from site.

3.4 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Design sheeting and shoring to be removed at completion of excavation work.

D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 BACKFILLING

A. Backfill trenches to contours and elevations with approved fill materials free of excessive moisture and frozen material.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Place material in continuous layers as follows:
1. General Fill: Maximum 8 inches compacted depth.
2. Structural Fill: Maximum 8 inches compacted depth.

D. Employ placement method that does not disturb or damage foundation perimeter drainage, utilities in trench.

E. Maintain optimum moisture content of fill materials within ±2 percent to attain required compaction density.

F. Do not leave trench open at end of working day.

G. Protect open trench to prevent danger to the public.

3.6 TOLERANCES

A. Top Surface of Backfilling under Paved Areas: Plus or minus 1/2 inch from required elevations.

B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.7 FIELD QUALITY CONTROL

A. Perform all work in accordance with Section 31 23 16.

3.8 PROTECTION OF FINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION 312317

SECTION 312323-FILL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Backfilling site structures to subgrade elevations.
2. Fill under slabs-on-grade.
3. Fill under paving.
4. Fill for over-excavation.

B. Related Sections:
1. Section 310513 - Soils for Earthwork:
2. Section 310516 - Aggregates for Earthwork:
3. Section 312213 - Rough Grading:
4. Section 312316 - Excavation.
5. Section 312317 - Trenching: Backfilling of utility trenches.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT – NOT USED

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

C. NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

1.4 SUBMITTALS

A. Materials Source: Submit name of imported fill materials suppliers.

B. Provide certification that the fill material to be used for Rain Garden meets the specifications detailed on the plans.

C. Provide certification that the clay core for the pond liner meets or exceeds the specifications detailed on the plans.

D. Manufacturer's Certificate: Certify Products meets or exceed NJDEP requirements for “clean fill”.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. General Fill: As specified in Section 31 05 13.

B. Structural Fill: As specified in Section 31 05 13. Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand free of all organic material and contaminants, with a maximum particle size of 3 inches, between 10 and 70 percent by weight passing the U.S. Standard No. 40 sieve and containing no more than 12 percent by weight passing the U.S. Standard No. 200 sieve. Recycled concrete is considered suitable for use as engineered fill when approved by Geotechnical Engineer. Imported fill material shall be approved by Geotechnical Engineer well in advance of fill construction.

2.2 ACCESSORIES – NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

B. Verify structural ability of unsupported walls to support loads imposed by fill.

3.2 PREPARATION

A. Compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill and compact to density equal to or greater than requirements for subsequent fill material.

C. Scarify subgrade surface to depth of 6 inches.

D. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

E. For Rain Garden, there shall be no compaction of the subgrade. Subgrade shall be scarified to a depth of 6" below planting bed mix.

3.3 BACKFILLING

A. Backfill areas to contours and elevations with approved materials free of excessive moisture and frozen material.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Place material in continuous layers as follows:
1. General Fill: Maximum 8 inches compacted depth.
2. Structural Fill: Maximum 8 inches compacted depth.
3. Planting Bed Mix: Material shall be placed in 12 to 18 inch lifts.

D. Employ placement method that does not disturb or damage other work.

E. Maintain optimum moisture content of backfill materials within ±2 percent to attain required compaction density.

F. Backfill against supported foundation walls. Do not backfill against unsupported foundation walls.

G. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

H. Slope grade away from building minimum 2 percent slope for minimum distance of 10 ft, unless noted otherwise.

I. Make gradual grade changes. Blend slope into level areas.

J. Remove surplus backfill materials from site.

K. Leave fill material stockpile areas free of excess fill materials.

L. Structural fill shall be compacted to at least 95 percent of the laboratory determined dry density per ASTM D1557 for footings, slab on grade and pavement.

M. Fill of Rain Garden shall be performed with all construction vehicles outside the limits of the Rain Garden.

3.4 TOLERANCES

A. Top Surface of Backfilling under Paved Areas. Plus or minus ½ inch from required elevations.

B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

A. Perform all work in accordance with Section 31 23 16.

3.6 PROTECTION OF FINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic.

END OF SECTION

SECTION 321123-AGGREGATE BASE COURSES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aggregate subbase.

B. Related Sections:
   1. Section 321313 – Concrete Paving
   2. Section 329119 - Landscape Grading

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT – NOT USED

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.
   2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
   5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   6. ASTM D2940 - Standard Specification for Graded Aggregate Material For Bases or Subbases for Highways or Airports.
   7. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

1.5 SUBMITTALS

A. Product Data:
   1. Submit data for geotextile fabric.

B. Materials Source: Submit name of aggregate materials suppliers.

C. Manufacturer's Certificate: Certify Products meet or exceed NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

1.6 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Perform Work in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

PART 2 PRODUCTS

2.1 AGGREGATE MATERIALS

A. Subbase Aggregate: NJDOT Soil Aggregate Designation I-5. DGA may be substituted for I-5 upon approval by the Engineer.

Sieve Size	Percent Passing
2 inches	100
3/4"	70-100
No. 4	30 -80
No. 50	10 -35
No. 200	5 to 12

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify compacted substrate is dry and ready to support paving and imposed loads.

1. Proof roll substrate with 20 ton vibratory roller in minimum two perpendicular passes to identify soft spots.
2. Remove soft substrate and replace with compacted fill as specified in Section 31 23 23 .

B. Verify substrate has been inspected, gradients and elevations are correct.

3.2 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT

A. Spread aggregate over prepared substrate to total compacted thickness indicated on Drawings.

B. Roller compact aggregate to 95 percent maximum density.

C. Level and contour surfaces to elevations, profiles, and gradients indicated.

D. Add small quantities of fine aggregate to coarse aggregate when required to assist compaction.

E. Maintain optimum moisture content of fill materials to attain specified compaction density.

F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A. Maximum Variation from Flat Surface: ½ inch measured with 10 foot straight edge.

B. Maximum Variation From Thickness: 1/4 inch.

C. Maximum Variation From Elevation: 1/2 inch.

3.5 FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with AASHTO T310.

B. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

C. Frequency of Tests: One test for every 1000 square yards of each layer compacted aggregate.

END OF SECTION 321123

SECTION 321216 - ASPHALT PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Asphalt materials.
2. Aggregate materials.
3. Aggregate subbase.
4. Asphalt paving base course, binder course, and wearing course.
5. Asphalt paving overlay for existing paving.

B. Related Sections:

1. Section 312213 - Rough Grading
2. Section 312323 - Fill
3. Section 321123 - Aggregate Base Courses
4. Section 321723 - Pavement Markings: Painted pavement markings, lines, and legends.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT – NOT USED

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO M17 - Standard Specification for Mineral Filler for Bituminous Paving Mixtures.
2. AASHTO M29 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
3. AASHTO M140 - Standard Specification for Emulsified Asphalt.
4. AASHTO M320 - Standard Specification for Performance-Graded Asphalt Binder.
5. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
6. AASHTO MP1a - Standard Specification for Performance-Graded Asphalt Binder.

B. Asphalt Institute:
1. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot- Mix Types.
2. AI MS-19 - Basic Asphalt Emulsion Manual.
3. AI SP-2 - Superpave Mix Design.

C. ASTM International:
1. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
2. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.

3. ASTM D242 - Standard Specification for Mineral Filler For Bituminous Paving Mixtures.
4. ASTM D692 - Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.
5. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
6. ASTM D977 - Standard Specification for Emulsified Asphalt.
7. ASTM D1073 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
8. ASTM D1188 - Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
9. ASTM D2027 - Standard Specification for Cutback Asphalt (Medium-Curing Type).
10. ASTM D2397 - Standard Specification for Cationic Emulsified Asphalt.
11. ASTM D2726 - Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
12. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
13. ASTM D3381 - Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.
14. ASTM D3515 - Standard Specification for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
15. ASTM D3549 - Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
16. ASTM D3910 - Standard Practices for Design, Testing, and Construction of Slurry Seal.
17. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
18. ASTM E408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
19. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
20. ASTM E1918 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
21. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

D. NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data:
1. Submit product information for asphalt and aggregate materials.
2. Submit mix design with laboratory test results supporting design.
3. Submit certification that the product is an approved NJDOT mix design.

C. Manufacturer's Certificate: Certify Products meet or exceed NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

1.5 QUALITY ASSURANCE

A. Mixing Plant: Conform to NJDOT Standard Specifications for Road and Bridge Construction, current edition, as amended.

B. Obtain materials from same source throughout.

C. Perform Work in accordance with NJDOT Standard Specifications for Road and Bridge Construction, current edition, as amended.

1.6 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with minimum five (5) years documented experience.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 016000 - Product Requirements: Environmental conditions affecting products on site.

B. Do not place asphalt mixture when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.1 ASPHALT MATERIALS

A. Asphalt Cement: In accordance with NJDOT Standard Specifications for Road and Bridge Construction, current edition, as amended.

B. Tack Coat: In accordance with NJDOT Standard Specifications for Road and Bridge Construction, current edition, as amended.

2.2 AGGREGATE MATERIALS

A. Coarse Aggregate: In accordance with Section 310516 .In accordance with NJDOT Standard Specifications for Road and Bridge Construction, current edition, as amended.

B. Fine Aggregate: In accordance with Section 310516; natural sand or sand manufactured from stone, gravel, or blast furnace slag. In accordance with NJDOT Standard Specifications for Road and Bridge Construction, current edition, as amended.

2.3 MIXES

A. Use dry material to avoid foaming. Mix uniformly.

B. Asphalt Paving Mixtures: Designed in accordance with NJDOT Standard Specifications for Road and Bridge Construction, current edition, as amended with maximum 15 percent by weight reclaimed asphalt pavement.

1. Base Course: As indicated on the drawings
2. Wearing Course: As indicated on the drawings

2.4 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing requirements.

B. Submit proposed mix design of each class of mix for review prior to beginning of Work.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.

C. Verify compacted subbase is dry and ready to support paving and imposed loads.

1. Prepare subbase in accordance with NJDOT Standard Specifications for Road and Bridge Construction, current edition, as amended.
2. Remove soft subbase and replace with compacted fill as specified in Section 31 23 23

D. Verify gradients and elevations of base are correct.

E. Verify gutter drainage grilles and frames and manhole frames are installed in correct position and elevation.

3.2 SUBBASE

A. Prepare subbase in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

3.3 EXISTING WORK

A. Saw cut and notch existing paving.

B. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.

C. Repair surface defects in existing paving to provide uniform surface to receive new paving.

3.4 MILLING

A. Milling shall be performed in in accordance with NJDOT Standard Specifications for Road and Bridge Construction, current edition, as amended.

3.5 TACK COAT

A. Apply tack coat at a rate of .1 gal/SY in accordance with NJDOT Standard Specifications for Road and Bridge Construction, current edition, as amended.

B. Apply tack coat to contact surfaces of curbs and gutters.

C. Coat surfaces of manhole and catch basin frames with oil to prevent bond with asphalt paving. Do not tack coat these surfaces.

3.6 SINGLE COURSE ASPHALT PAVING

A. Install Work in accordance with NJDOT Standard Specifications for Road and Bridge Construction, current edition, as amended.

B. Place asphalt within 24 hours of applying primer or tack coat.

C. Place asphalt wearing course to thickness indicated on Drawings.

D. Compact paving by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.

E. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.7 ASPHALT PAVING OVERLAY

A. Apply tack coat to existing paving surface at .10 gal/sy.

B. Place wearing course to thickness indicated on Drawings.

C. Compact overlay by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.

D. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.8 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements Tolerances.

B. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

C. Scheduled Compacted Thickness: Within 1/8 inch.

D. Variation from Indicated Elevation: Within 1/4 inch.

3.9 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Install work in accordance with NJDOT Standard Specifications for Road and Bridge Construction, current edition, as amended.

3.10 PROTECTION OF FINISHED WORK

A. Immediately after placement, protect paving from mechanical injury for 24 hours or until surface temperature is less than 140 degrees F.

END OF SECTION

SECTION 321313-CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aggregate subbase.
   2. Concrete paving for:
      a. Concrete sidewalks and ramps.

B. Related Sections:
   1. Section 312213 - Rough Grading
   2. Section 321123 - Aggregate Base Courses.
   3. Section 329119 - Landscape Grading

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT - NOT USED

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

B. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

C. ASTM International:
   1. ASTM A184/A184M - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
   2. ASTM A185/A185M - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
   3. ASTM A497/A497M - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
   4. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   5. ASTM A775/A775M - S Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
   6. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
   7. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
   8. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
   9. ASTM C33 - Standard Specification for Concrete Aggregates.
   10. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

11. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
12. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
13. ASTM C150 - Standard Specification for Portland Cement.
14. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
15. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
16. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
17. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
18. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
19. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
20. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
21. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
22. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
23. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
24. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
25. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
26. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

D. NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

1.4 SUBMITTALS

A. Product Data:
   1. Submit data on concrete materials, joint filler, admixtures, curing compounds.
   2. Provide certification that the product is an approved NJDOT mix design.

B. Design Data:
   1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
      a. Hot and cold weather concrete work.
   2. Identify mix ingredients and proportions, including admixtures.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and requirements of Section 03 10 00, Section 032000 and Section 033000.

B. Obtain cementitious materials from same source throughout.

C. Perform Work in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

D. All ramps and sidewalks shall be in compliance with the New Jersey Barrier Free Code and ICC / ANSI A117.1.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing work of this section with minimum 3 years experience.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Form Materials: Conform to ACI 301.

B. Joint Filler: ASTM D1751; Asphalt impregnated fiberboard or felt, 1/2 inch thick.

2.2 REINFORCING

A. Reinforcing Steel and Wire Fabric: Type specified in Section 03 20 00 and as shown on the project drawings.

B. Welded Plain Wire Fabric: ASTM A185/A185M; in flat sheets at locations shown on the project drawings.

2.3 CONCRETE MATERIALS

A. Concrete Materials: As specified in Section 03 30 00 Provide in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

B. Fine and Coarse Aggregates: ASTM C33, as specified in Section 3105 16.

C. Water: ASTM C94/C94M; potable, not detrimental to concrete

D. Air Entrainment: ASTM C260.

E. Chemical Admixture: ASTM C494/C494M.

1. Type A - Water Reducing.
2. Type B - Retarding.

2.4 ACCESSORIES

A. Curing Compound: Per NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

B. Joint Sealers: Per NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

2.5 CONCRETE MIX - BY PERFORMANCE CRITERIA

A. Mix and deliver concrete in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

B. Select proportions for normal weight concrete in accordance with ACI 301 Method 1.

C. Provide concrete to the strength and/or mix design specified on the drawings.

D. Use accelerating admixtures in cold weather only when approved by the Architect/Engineer in writing. Use of admixtures will not relax cold weather placement requirements.

E. Use calcium chloride only when approved by the Architect/Engineer in writing.

F. Use set retarding admixtures during hot weather only when approved by the Architect/Engineer in writing.

2.6 SOURCE QUALITY CONTROL AND TESTS

A. Submit proposed mix design of each class of concrete to appointed firm for review prior to commencement of Work.

B. Tests on cement, aggregates, and mixes will be performed to ensure conformance with specified requirements.

C. Test samples in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify compacted subgrade is dry and ready to support paving and imposed loads.

1. Remove soft subbase and replace with compacted fill as specified in Section 31 23 23

B. Verify gradients and elevations of base are correct.

3.2 SUBBASE

A. Aggregate Subbase: Install as specified in Section 32 11 23

B. Prepare subbase in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended...

3.3 PREPARATION

A. Moisten substrate to minimize absorption of water from fresh concrete.

B. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete paving.

C. Notify Architect/Engineer minimum 24 hours prior to commencement of concreting operations.

3.4 FORMING

A. Place and secure forms and screeds to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

3.5 REINFORCING

A. Place reinforcing as indicated on Drawings.

B. Interrupt reinforcing at contraction or expansion joints.

3.6 PLACING CONCRETE

A. Place concrete in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

B. Ensure reinforcing, inserts, embedded parts, formed joints are not disturbed during concrete placement.

C. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

3.7 JOINTS

A. Place expansion joints at 20 foot intervals. Align curb, gutter, and sidewalk joints.

B. Place joint filler between paving components and building or other appurtenances. Recess top of filler 1/4 inch for sealant installation.

C. Provide sawcut joints at 5’ intervals maximum, or as the pattern indicated on the drawings.

D. Provide keyed joints as indicated.

3.8 FINISHING

A. Sidewalk Paving: Light broom, radius to 1/2 inch radius, and trowel joint edges, Wood float.

B. Curbs and Gutters: Light broom.

C. Scouring pattern of concrete is to be as specified on drawings. Seventy-two (72) hours prior to pouring the concrete for sidewalks, Contractor shall verify and confirm all dimensions of scoring pattern with the Engineer/Architect.

D. Direction of Texturing: Transverse to paving direction.

3.9 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Cure surfaces in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

3.10 ERECTION TOLERANCES

A. Maximum Variation of Surface Flatness: ¼ inch in 10 ft.

B. Maximum Variation From True Position: 1/4 inch.

3.11 FIELD QUALITY CONTROL

A. Inspect reinforcement placement for size, spacing, location, support.

B. Testing firm will take cylinders and perform slump tests in accordance with ACI 301

C. All work shall comply with Section 030000.

3.12 PROTECTION

A. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian or vehicular traffic over paving for 7 days minimum after finishing. Until 75 percent design strength of concrete has been achieved.

END OF SECTION 321313

SECTION 321723 - PAVEMENT MARKINGS AND SIGNS

1.1 SUMMARY

A. Section Includes:
1. Traffic lines and markings.
2. Legends.
3. Paint.
4. Glass beads.

B. Related Sections:
1. Section 321216 - Asphalt Paving.
2. Section 321313 - Concrete Paving.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT – NOT USED

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO M247 - Standard Specification for Glass Beads Used in Traffic Paint.

B. ASTM International:
1. ASTM D34 - Standard Guide for Chemical Analysis of White Pigments.
2. ASTM D126 - Standard Test Methods for Analysis of Yellow, Orange, and Green Pigments Containing Lead Chromate and Chromium Oxide Green.
3. ASTM D562 - Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer.
4. ASTM D711 - Standard Test Method for No-Pick-Up Time of Traffic Paint.
5. ASTM D713 - Standard Practice for Conducting Road Service Tests on Fluid Traffic Marking Materials.
6. ASTM D969 - Standard Test Method for Laboratory Determination of Degree of Bleeding of Traffic Paint.
7. ASTM D1301 - Standard Test Methods for Chemical Analysis of White Lead Pigments.
8. ASTM D1394 - Standard Test Methods for Chemical Analysis of White Titanium Pigments.
9. ASTM D1475 - Standard test Method for Density of Liquid Coatings, Inks, and Related Products.
10. ASTM D1640 - Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature.
11. ASTM D2202 - Standard Test Method for Slump of Sealants.
12. ASTM D2371 - Standard Test Method for Pigment Content of Solvent-Reducible Paints.
13. ASTM D2621 - Standard Test Method for Infrared Identification of Vehicle Solids From Solvent-Reducible Paints.
14. ASTM D2743 - Standard Practices for Uniformity of Traffic Paint Vehicle Solids by Spectroscopy and Gas Chromatography.

C. NJDOT Standard Specifications for Road and Bridge Construction, current edition, as amended.

D. Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), current edition, as amended.

1.4 PERFORMANCE REQUIREMENTS

A. Paint Adhesion: Adhere to road surface forming smooth continuous film one minute after application.

B. Paint Drying: Tack free by touch so as not to require coning or other traffic control devices to prevent transfer by vehicle tires within two minutes after application.

1.5 SUBMITTALS

A. Product Data:
   1. Submit paint formulation for each type of paint.
   2. Submit a shop drawing for each sign.

B. Test Reports: Submit source and acceptance test results in accordance with AASHTO M247.

C. Manufacturer's Installation Instructions: Submit instructions for application temperatures, eradication requirements, application rate, line thickness, type of glass beads, bead embedment and bead application rate, and any other data on proper installation.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

1.7 QUALIFICATIONS

A. Applicator: Company specializing in performing work of this section with minimum 5 years experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Invert containers several days prior to use when paint has been stored more than 2 months. Minimize exposure to air when transferring paint. Seal drums and tanks when not in use.

B. Glass Beads. Store glass beads in cool, dry place. Protect from contamination by foreign substances.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.

B. Do not apply exterior coatings during rain or snow when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by paint product manufacturer.

C. Do not apply paint when temperatures are expected to fall below 50 degrees F for 24 hours after application.

D. Volatile Organic Content (VOC). Do not exceed State or Environmental Protection Agency maximum VOC on traffic paint.

1.10 WARRANTY

A. Furnish three year manufacturer's warranty for traffic paints.

PART 2 PRODUCTS

2.1 PAINTED PAVEMENT MARKINGS

A. Furnish materials in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

B. Paint: In accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

2.2 EQUIPMENT

A. For application of crosswalks, intersections, stop lines, legends and other miscellaneous items by walk behind stripers, hand spray or stencil trucks, apply with equipment meeting requirements of this section. Do not use hand brushes or rollers. Optionally apply glass beads by hand.

2.3 SIGNS

A. All signs shall be in conformance with the MUTCD.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not apply paint to concrete surfaces until concrete has cured for 28 days.

3.2 PREPARATION

A. Maintenance and Protection of Traffic:
   1. Provide short term traffic control
   2. Prevent interference with marking operations and to prevent traffic on newly applied markings before markings dry.
   3. Maintain travel lanes between 7: 00 AM to 9: 00 AM, and between 4: 00 PM and 6: 00 PM.

B. Surface Preparation.
   1. Clean and dry paved surface prior to painting.

2. Blow or sweep surface free of dirt, debris, oil, grease or gasoline.

3.3 EXISTING WORK

A. Remove existing markings in an acceptable manner. Do not remove existing pavement markings by painting over with blank paint. Remove by methods that will cause least damage to pavement structure or pavement surface. Satisfactorily repair any pavement or surface damage caused by removal methods.

B. Clean and repair existing lines and legends.

3.4 APPLICATION

A. Install Work in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended...

3.5 APPLICATION TOLERANCES

A. Maximum Variation from Wet Film Thickness: 1 mil.

B. Maximum Variation from Wet Paint Line Width: Plus or minus 1/8 inch.

3.6 FIELD QUALITY CONTROL

A. Inspect for incorrect location, insufficient thickness, line width, coverage, retention, uncured or discolored material, and insufficient bonding.

B. Repair lines and markings, which after application and curing do not meet following criteria:
1. Incorrect Location: Remove and replace incorrectly placed patterns.
2. Insufficient Thickness, Line Width, Paint Coverage, Glass Bead Coverage or Retention: Prepare defective material by acceptably grinding or blast cleaning to remove substantial amount of beads and to roughen marking surface. Remove loose particles and debris. Apply new markings on cleaned surface in accordance with this Section.
3. Uncured or Discolored Material, Insufficient Bonding: Remove defective markings in accordance with this Section and clean pavement surface one foot beyond affected area. Apply new markings on cleaned surface in accordance with this Section.

C. Replace defective pavement markings as specified throughout 3 year warranted period. Replace markings damaged by anti-skid materials, studded tires, tire chains, chemical deicers, and snow plowing or other loss of marking material regardless of cause. When markings are damaged by pavement failure or by Owner’s painting, crack sealing, or pavement repair operations, Contractor is released from warranty requirements for damaged work.

D. Prepare list of defective areas and areas requiring additional inspection and evaluation to decide where material may need replaced. Provide traffic control as necessary if markings require more detailed evaluation.

E. Replace pavement marking material under warranty using original or better type material. Continue warranty to end of original 3 year period even when replacement materials have been installed as specified.

F. When eradication of existing paint lines is necessary, eradicate by shot blast or water blast method. Do not gouge or groove pavement more than 1/16 inch during removal. Limit area of removal to area of marking plus 1 inch on all sides. Prevent damage to transverse and longitudinal joint sealers, and repair any damage according to requirements in Section 32 13 13 or Section 32 12 16.

G. Maintain daily log showing work completed results of above inspections or tests, pavement and air temperatures, relative humidity, presence of any moisture on pavement, and any material or equipment problems. Make legible entries in log in ink, sign and submit by end of each work day. Enter environmental data into log prior to starting work each day and at two additional times during day.

3.7 PROTECTION OF FINISHED WORK

A. Protect painted pavement markings from vehicular and pedestrian traffic until paint is dry and track free. Follow manufacturer's recommendations or use minimum of 30 minutes. Consider barrier cones as satisfactory protection for materials requiring more than 2 minutes dry time.

END OF SECTION

SECTION 329119-LANDSCAPE GRADING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Final grade topsoil for finish landscaping.

B. Related Sections:
   1. Section 329219 - Seeding

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT – NOT USED

1.3 SUBMITTALS

A. Materials Source: Submit name of imported materials source and certification that Topsoil meets the specifications of NJDOT Section 917.01.

1.4 QUALITY ASSURANCE

A. Furnish each topsoil material from single source throughout the Work.

B. Perform work in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

PART 2 PRODUCTS

2.1 MATERIAL

A. Topsoil shall be in accordance with NJDOT Specifications (Section 917.01).

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify building and trench backfilling have been inspected.

B. Verify substrate base has been contoured and compacted.

3.2 PREPARATION

A. Protect landscaping and other features remaining as final Work.

B. Protect existing structures, fences, sidewalks, utilities, paving, and curbs.

3.3 SUBSTRATE PREPARATION

A. Eliminate uneven areas and low spots.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove contaminated subsoil.

C. Scarify surface to depth of 3 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.4 PLACING TOPSOIL

A. Place topsoil in areas where seeding, planting, is required. Place topsoil during dry weather.

B. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.

C. Remove roots, weeds, rocks, and foreign material while spreading.

D. Manually spread topsoil close to plant material to prevent damage.

E. Lightly compact placed topsoil.

F. Remove surplus subsoil and topsoil from site.

G. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.5 TOLERANCES

A. Top of Topsoil: Plus or minus 1/2 inch.

3.6 PROTECTION OF INSTALLED WORK

A. Prohibit construction traffic over topsoil.

END OF SECTION 329119

SECTION 329219 - SEEDING

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. Section Includes:
1. Fertilizing.
2. Seeding.
3. Hydroseeding.
4. Mulching.
5. Maintenance.

B. Related Sections:

1. Section 312000 - Earthmoving
2. Section 329119 - Landscape Grading

1.3 REFERENCES

A. ASTM International:
1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

B. NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

1.4 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

1.5 SUBMITTALS

A. Product Data: Submit data for seed mix, fertilizer, and mulch, and other accessories.

B. Provide certification that the seed mix is approved by the Mercer County Conservation District.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Include maintenance instructions, cutting method and maximum grass height;

1.7 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

B. Perform Work in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

C. Perform Work in accordance with the approved Soil Erosion and Sediment Control Plan and Mercer County Conservation District requirements.

1.8 QUALIFICATIONS

A. Seed Supplier: Company specializing in manufacturing Products specified in this section with minimum three years of experience.

B. Approved Suppliers, include, but are not necessarily limited to;

1. Ernst Conservation Seeds, Inc., 8884 Mercer Pike, Meadville, Pennsylvania, 16335
2. Or equivalent.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.10 MAINTENANCE SERVICE

A. Maintain seeded areas immediately after placement until grass is well established and exhibits vigorous growing condition for two cuttings.

PART 2 PRODUCTS

2.1 SEED MIXTURE

A. Furnish materials in accordance with NJDOT Standard Specifications for Road and Bridge Construction, 2007, as amended.

B. Lawn Seed Mixture: As specified on the plans in accordance with Mercer County Conservation District standards.

2.2 ACCESSORIES

A. Mulching Material: As specified on the project drawings.

B. Fertilizer: As specified on the project drawings.

C. Lime: ASTM C602, Class T agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.

D. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.

2.3 SOURCE QUALITY CONTROL

A. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

B. Testing is not required when recent tests and certificates are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify prepared soil base is ready to receive the Work of this section.

B. Any areas of soil compaction shall be scarified.

3.2 FERTILIZING

A. Apply lime at application rate recommended by soil analysis. Work lime into top 4 inches of soil.

B. Apply fertilizer at application rate recommended by soil analysis.

C. Apply after smooth raking of topsoil

D. Do not apply fertilizer at same time or with same machine used to apply seed.

E. Mix fertilizer thoroughly into upper 4 inches of topsoil.

F. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

3.3 SEEDING

A. Apply seed at rate as specified on the plans evenly in two intersecting directions. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Planting Season: Seeding shall take place only from March 1st to April 30th or August 15, to October 15th. Seeding outside of those dates may only be performed if Owner's consent is received.

D. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph

E. Immediately following seeding and compacting, apply mulch to thickness of 1/8 inches. Maintain clear of shrubs and trees.

F. Apply water with fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

G. Contractor is responsible for watering of seed and grass until project close-out.

3.4 HYDROSEEDING

A. Apply fertilizer, mulch and seeded slurry with hydraulic seeder at rate specified by the Mercer County Conservation District. Hydroseeding may only be performed during the optimum seeding season.

B. After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

3.5 SEED PROTECTION

A. Cover seeded slopes where grade is 4:1 or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

B. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches . Backfill trench and rake smooth, level with adjacent soil.

C. Secure outside edges and overlaps at 36 inch intervals with stakes.

D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.6 MAINTENANCE

A. Lawn:
   1. Mow grass at regular intervals to maintain at maximum height of 3 inches. Do not cut more than 1/3 of grass blade at each mowing. Perform first mowing when seedlings are 40 percent higher than desired height.
   2. Neatly trim edges and hand clip where necessary.
   3. Immediately remove clippings after mowing and trimming. Do not let clippings lay in clumps.

4. Water to prevent grass and soil from drying out.
5. Control growth of weeds. Apply herbicides. Remedy damage resulting from improper use of herbicides.
6. Immediately reseed areas showing bare spots.
7. Repair washouts or gullies.
8. Protect seeded areas with warning signs during maintenance period.

B. Meadow Mix:
1. First year maintenance: Observation of the growth of desired species and weed competition is essential to making maintenance decisions. When vegetation reaches 12 to 18 inches tall, mow to no less than 6 inches with a mower or weed eater to prevent the weeds from going to seed. Most native plants will grow deeper root systems than tops in the first year and mowing to 6 to 8 inches will not hurt them. This allows sunlight to reach desired species. Do not mow with a lawn mower. Mowing to close encourages weedy species.

END OF SECTION 329219

SECTION 334100 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Nonpressure transition couplings.
3. Expansion joints and deflection fittings.
4. Manholes.
5. Stormwater inlets.
6. Pipe outlets.

1.3 DEFINITIONS

A. FRP: Fiberglass-reinforced plastic.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Manholes: Include plans, elevations, sections, details, frames, and covers.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

B. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet (1:500) and vertical scale of not less than 1 inch equals 5 feet (1:50). Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

C. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.

D. Field quality-control reports.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect and Owner no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner's written permission.

PART 2 - PRODUCTS

2.1 STEEL PIPE AND FITTINGS

A. Corrugated-Steel Pipe and Fittings: ASTM A 760/A 760M, Type I with fittings of similar form and construction as pipe.

1. Special-Joint Bands: Corrugated steel with O-ring seals.
2. Standard-Joint Bands: Corrugated steel.
3. Coating: Zinc.

2.2 ABS PIPE AND FITTINGS

A. ABS Sewer Pipe and Fittings: ASTM D 2751, with bell-and-spigot ends for gasketed joints.

1. NPS 3 to NPS 6 (DN 80 to DN 150): SDR 35.
2. NPS 8 to NPS 12 (DN 200 to DN 300): SDR 42.

B. Gaskets: ASTM F 477, elastomeric seals.

2.3 PE PIPE AND FITTINGS

A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10 (DN 80 to DN 250): AASHTO M 252M, Type S, with smooth waterway for coupling joints.

1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
2. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.

B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60 (DN 300 to DN 1500): AASHTO M 294M, Type S, with smooth waterway for coupling joints.

1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.
2. Soiltight Couplings: AASHTO M 294M, corrugated, matching pipe and fittings.

2.4 CONCRETE PIPE AND FITTINGS

A. Nonreinforced-Concrete Sewer Pipe and Fittings: ASTM C 14 (ASTM C 14M), Class 2 with bell-and-spigot ends and gasketed joints with ASTM C 443 (ASTM C 443M), rubber gaskets.

2.5 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Concrete Pipes: ASTM C 443 (ASTM C 443M), rubber.
2. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
3. For Fiberglass Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
4. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
5. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

1. 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. Dallas Specialty & Mfg. Co.
b. Fernco Inc.
c. Logan Clay Pipe.
d. Mission Rubber Company; a division of MCP Industries, Inc.
e. NDS Inc.

f. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

2. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

2.6 DRAINS

A. Cast-Iron Area Drains:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Josam Company.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.
d. Tyler Pipe.
e. Watts Water Technologies, Inc.
f. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

2. Description: ASME A112.6.3 gray-iron round body with anchor flange and round grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated.
3. Top-Loading Classification(s): Heavy Duty.

2.7 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches (1200 mm) minimum unless otherwise indicated on drawings.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch (102-mm) minimum thickness, and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit

steps if total depth from floor of manhole to finished grade is less than 60 inches (1500 mm)

10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch- (102-mm-) minimum width flange and 26-inch- (660-mm-) diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A 48/A 48M, Class 35 gray iron unless otherwise indicated.

2.8 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R (ACI 350M/350RM), and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

   a. Invert Slope: 2 percent through manhole.

2. Benches: Concrete, sloped to drain into channel.

   a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.9 STORMWATER INLETS

A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to utility standards.

B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.

C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.

D. Frames and Grates: Heavy duty, according to utility standards.

2.10 PIPE OUTLETS

A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.

B. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."

1. Average Size: NSSGA No. R-3, screen opening 2 inches (51 mm).
2. Average Size: NSSGA No. R-4, screen opening 3 inches (76 mm).
3. Average Size: NSSGA No. R-5, screen opening 5 inches (127 mm).

C. Filter Stone: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size graded stone.

D. Energy Dissipaters: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton (2721-kg) average weight armor stone, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.
2. Install piping NPS 6 (DN 150) and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
3. Install piping with 36-inch (915-mm) minimum cover.
4. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
5. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
6. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
7. Install corrugated steel piping according to ASTM A 798/A 798M.
8. Install ABS sewer piping according to ASTM D 2321 and ASTM F 1668.
9. Install PE corrugated sewer piping according to ASTM D 2321.
10. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
11. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
12. Install PVC water-service piping according to ASTM D 2321 and ASTM F 1668.
13. Install nonreinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join hub-and-spigot, cast-iron soil piping with gasketed joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
3. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
4. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
5. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
6. Join corrugated steel sewer piping according to ASTM A 798/A 798M.
7. Join corrugated aluminum sewer piping according to ASTM B 788/B 788M.
8. Join ABS sewer piping according to ASTM D 2321 and ASTM D 2751 for elastomeric-seal joints.
9. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
10. Join PVC cellular-core piping according to ASTM D 2321 and ASTM F 891 for solvent-cemented joints.
11. Join PVC corrugated sewer piping according to ASTM D 2321 for elastomeric-seal joints.
12. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
13. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
14. Join fiberglass sewer piping according to ASTM D 3839 for elastomeric-seal joints.
15. Join nonreinforced-concrete sewer piping according to ASTM C 14 (ASTM C 14M) and ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
16. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
17. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches (76 mm) above finished surface elsewhere unless otherwise indicated.

3.5 STORMWATER INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipaters at outlets, as indicated.

3.6 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.7 CONNECTIONS

A. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch (150-mm) overlap, with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500). Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
3. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches (150 mm) of concrete for minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi (20.7 MPa) unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

B. Connect to sediment interceptors specified in Section 221323 "Sanitary Waste Interceptors."

C. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

    a. [Unshielded] [Shielded] flexible couplings for same or minor difference OD pipes.

b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

2. Use pressure-type pipe couplings for force-main joints.

3.8 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch- (203-mm-) thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:

1. Remove manhole or structure and close open ends of remaining piping.
2. Remove top of manhole or structure down to at least 36 inches (915 mm) below final grade. Fill to within 12 inches (300 mm) of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.

C. Backfill to grade according to Section 312000 "Earth Moving."

3.9 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.10 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
b. Option: Test plastic piping according to ASTM F 1417.
c. Option: Test concrete piping according to ASTM C 924 (ASTM C 924M).

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION 334100

SECTION 270529 - HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Steel slotted support systems for communication raceways.
2. Aluminum slotted support systems for communication raceways.
3. Nonmetallic slotted support systems for communication raceways.
4. Conduit and cable support devices.
5. Support for conductors in vertical conduit.
6. Structural steel for fabricated supports and restraints.
7. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
8. Fabricated metal equipment support assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Slotted support systems, hardware, and accessories.
b. Clamps.
c. Hangers.
d. Sockets.
e. Eye nuts.
f. Fasteners.
g. Anchors.
h. Saddles.
i. Brackets.

2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: For fabrication and installation details for communications hangers and support systems.

1. Trapeze hangers. Include product data for components.
2. Steel slotted-channel systems.
3. Aluminum slotted-channel systems.
4. Nonmetallic slotted-channel systems.
5. Equipment supports.
6. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated-Design Submittal: For hangers and supports for communications systems.

1. Include design calculations and details of trapeze hangers.
2. Include design calculations for seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Ductwork, piping, fittings, and supports.
3. Structural members to which hangers and supports will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Items penetrating finished ceiling, including the following:

    a. Luminaires.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Projectors.

B. Seismic Qualification Data: Certificates, for hangers and supports for communications equipment and systems, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to **AWS D1.1/D1.1M**.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M.
2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.

B. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to **ASCE/SEI 7**.

1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified **and the system will be fully operational after the seismic event**."
2. Component Importance Factor: **1.5**.

C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame Rating: Class 1.
2. Self-extinguishing according to ASTM D635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-(10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.
1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
2. Material for Channel, Fittings, and Accessories: **Galvanized steel**.
3. Channel Width: **1-5/8 inches (41.25 mm)**
4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

8. Channel Dimensions: Selected for applicable load criteria.

B. Aluminum Slotted Support Systems: Extruded aluminum channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.
   1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
   2. Channel Material: 6063-T6 aluminum alloy.
   3. Fittings and Accessories Material: 5052-H32 aluminum alloy.
   4. Channel Width: **Selected for applicable load criteria 1-5/8 inches.**
   5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
   6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
   7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
   8. Channel Dimensions: Selected for applicable load criteria.

C. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least one surface.
   1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
   2. Channel Width: **1-5/8 inches (41.25 mm)**.
   3. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
   4. Fitting and Accessory Materials: Same as those for channels and angles**, except metal items may be stainless steel**.
   5. Rated Strength: Selected to suit applicable load criteria.
   6. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. Conduit and Cable Support Devices: **Steel** clamps, hangers, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored communications 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 made of malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

   1. Powder-Actuated Fasteners: Threaded-steel stud for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

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 where used.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M,Grade A325 (Grade A325M).
6. Toggle Bolts: **All-steel** springhead type.
7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA/BICSI 568.
3. TIA-569-D.
4. NECA 101.
5. NECA 102.
6. NECA 105.
7. NECA 111.

B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for pathways specified in Section 270528 "Pathways for Communications Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as **required by scheduled in NECA 1, where its Table 1 lists maximum spacings that are less than those stated in** NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

E. 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**.

F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Raceway Support Methods: In addition to methods described in NECA 1, **EMT** may be supported by openings through structure members, according to NFPA 70.

B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten communications 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: Use approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Use expansion anchor fasteners.
5. To Steel: **Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts**.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate **by means that comply with seismic-restraint strength and anchorage requirements**.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor communications materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 270529

SECTION 270553 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes.
5. Signs.
6. Cable ties.
7. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for communications identification products.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule:

1. Outlets: Scaled drawings indicating location and proposed designation.
2. Backbone Cabling: Riser diagram showing each communications room, backbone cable, and proposed backbone cable designation.
3. Racks: Scaled drawings indicating location and proposed designation.
4. Patch Panels: Enlarged scaled drawings showing rack row, number, and proposed designations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 70 and TIA 606-B.

B. Comply with ANSI Z535.4 for safety signs and labels.

C. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: [**120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces**] <**Insert temperature change**>.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Equipment Identification Labels:

1. Black letters on a white field.
2. <**Insert specific requirements for equipment to be labeled, such as racks, cabinets, etc.**>.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

B. Self-Adhesive Wraparound Labels: **Write-on**, 3-mil- (0.08-mm-) thick, **vinyl** flexible labels with acrylic pressure-sensitive adhesive.
1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating protective shields over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
2. Marker for Labels: Permanent, waterproof black ink marker recommended by tag manufacturer.
3. Marker for Labels: Machine-printed, permanent, waterproof black ink recommended by printer manufacturer.

2.4 BANDS AND TUBES

A. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.

2.5 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, and ANSI Z535.4.
2. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL-FIBER CABLE" <**Insert inscription**>.

2.6 SIGNS

A. Baked-Enamel Signs:
1. Preprinted aluminum signs, [**high-intensity reflective,**]punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches (180 by 250 mm).

2.7 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
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, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C) according to ASTM D638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain 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 PREPARATION

A. Self-Adhesive Identification Products: Before applying communications identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of communications systems and connected items.

G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

H. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
3. Provide label 6 inches (150 mm) from cable end.

I. Snap-Around Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Provide label 6 inches (150 mm) from cable end.

J. Self-Adhesive Wraparound Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Provide label 6 inches (150 mm) from cable end.

K. Self-Adhesive Labels:

1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.

L. Snap-Around, Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

M. Underground-Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench [**or concrete envelope**]exceeds 16 inches (400 mm) overall.
2. Limit use of underground-line warning tape to direct-buried cables.
3. Install underground-line warning tape for direct-buried cables and cables in raceways.

N. Cable Ties: General purpose, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations with high visibility. Identify by system and circuit designation.

C. Accessible Fittings for Raceways and Cables within Buildings: Identify covers of each junction and pull box with self-adhesive labels containing wiring system legend.

1. System legends shall be as follows:

a. Telecommunications.

D. Faceplates: Label individual faceplates with self-adhesive labels. Place label at top of faceplate. Each faceplate shall be labeled with its individual, sequential designation**,** composed of the following, in the order listed:

1. Wiring closet designation.
2. Colon.
3. Faceplate number.

E. Equipment Room Labeling:

1. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels
2. Patch Panels:
3. Data Outlets: Label each outlet with a self-adhesive label indicating the following, in the order listed:

a. Room number being served.
b. Colon.
c. Faceplate number.

F. Backbone Cables: Label each cable with a **vinyl-wraparound label** indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.

G. Horizontal Cables: Label each cable with a **vinyl-wraparound label** indicating the following, in the order listed:

1. Room number.
2. Colon.
3. Faceplate number.

H. Locations of Underground Lines: Underground-line warning tape for copper, coaxial, hybrid copper/fiber, and optical-fiber cable.

I. Instructional Signs: Self-adhesive labels.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures: **Self-adhesive labels**.

1. Apply to exterior of door, cover, or other access.

K. Equipment Identification Labels:

1. Indoor Equipment: **Self-adhesive label**
2. Outdoor Equipment: **Laminated-acrylic or melamine-plastic sign**.
3. Equipment to Be Labeled:

    a. Communications cabinets.
    b. Uninterruptible power supplies.
    c. Computer room air conditioners.
    d. Fire-alarm and suppression equipment.
    e. Egress points.
    f. Power distribution components.

END OF SECTION 270553

SECTION 271513 - COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Category 6 twisted pair cable.
2. Twisted pair cable hardware, including plugs and jacks.
3. Multiuser telecommunications outlet assembly.
4. Cable management system.
5. Cabling identification products.
6. Grounding provisions for twisted pair cable.
7. Source quality control requirements for twisted pair cable.

1.3 DEFINITIONS

A. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

B. EMI: Electromagnetic interference.

C. FTP: Shielded twisted pair.

D. F/FTP: Overall foil screened cable with foil screened twisted pair.

E. F/UTP: Overall foil screened cable with unscreened twisted pair.

F. IDC: Insulation displacement connector.

G. LAN: Local area network.

H. Jack: Also commonly called an "outlet," it is the fixed, female connector.

I. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.

J. RCDD: Registered Communications Distribution Designer.

K. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

L. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

M. S/FTP: Overall braid screened cable with foil screened twisted pair.

N. S/UTP: Overall braid screened cable with unscreened twisted pairs.

O. UTP: Unscreened (unshielded) twisted pair.

1.4 COPPER HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable cabling system shall provide interconnections between Distributor A, Distributor B, or Distributor C, and the equipment outlet, otherwise known as "Cabling Subsystem 1," in the telecommunications cabling system structure. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.

1. TIA-568-C.1 requires that a minimum of two equipment outlets 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 equipment outlet.
3. Bridged taps and splices shall not be installed in the horizontal cabling.

B. A work area is approximately 100 sq. ft. (9.3 sq. m), and includes the components that extend from the equipment outlets to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment or in the horizontal cross-connect.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

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 and installation details of telecommunications equipment, to show location and layout of telecommunications equipment, including the following:

a. Telecommunications rooms plans and elevations.
b. Telecommunications pathways.
c. Telecommunications system access points.
d. Telecommunications grounding system.

e. Telecommunications conductor drop locations.
f. Typical telecommunications details.
g. Mechanical, electrical, and plumbing systems.

C. Twisted pair cable testing plan.

D. Samples: For telecommunications jacks and plugs, [**in specified finish, one for each type and configuration**] [**and faceplates for color selection and evaluation of technical features**].

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For **RCDD,** installation supervisor, and field inspector.

B. Product Certificates: For each type of product.

C. Source quality-control reports.

D. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For splices and connectors to include in maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On USB media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Connecting Blocks: **One** of each type.
2. Faceplates: **One** of each type.
3. Jacks: **Ten** of each type.
4. Multiuser Telecommunications Outlet Assemblies: **One** of each type.
5. Patch-Panel Units:**One** of each type.
6. Plugs: **Ten** of each type.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings by an RCDD.

2. Installation Supervision: Installation shall be under the direct supervision of **Technician**, who shall be present at all times when Work of this Section is performed at Project site.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of twisted pair cable for open and short circuits.

1.11 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.

1.12 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

1.13 SOFTWARE SERVICE AGREEMENT

A. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within **two** years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide **30** days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

C. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:
   1. Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
   2. Communications, Non-plenum: Type CMR complying with UL 1666[**and ICEA S-103-701**].
   3. Communications, Non-plenum: Type CMP or Type CMR in listed plenum or riser communications raceway.
   4. Communications, Non-plenum: Type CMP or Type CMR in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

   1. Flame-Spread Index: **25** or less.
   2. Smoke-Developed Index: **50** or less.

C. RoHS compliant.

2.3 CATEGORY 5e TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 5e cable at frequencies up to 100 MHz.

B. Standard: Comply with ICEA S-90-661, NEMA WC 63.1, and TIA-568-C.2 for Category 5e cables.

C. Conductors: 100-ohm, 24 AWG solid copper.

D. Shielding/Screening: **Unshielded twisted pairs (UTP)**.

E. Cable Rating: **Riser**.

F. Jacket: **White** thermoplastic.

2.4 CATEGORY 6 TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, **with internal spline,** certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz.

B. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.

C. Conductors: 100-ohm, 23 AWG solid copper.

D. Shielding/Screening: **Unshielded twisted pairs (UTP).**

E. Cable Rating: [**Riser**] [**Plenum**].

F. Jacket: **White** thermoplastic.

2.5 TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.

B. General Requirements for Twisted Pair Cable Hardware:

1. Comply with the performance requirements of **Category 6** .
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables shall be terminated with connecting hardware of same category or higher.

C. Connecting Blocks:

1. 110-style IDC for Category 5e.
2. 66-style IDC for Category 5e.
3. 110-style IDC for Category 6.
4. 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.

5. Number of Terminals per Field: **One** for each conductor in assigned cables.

D. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.

1. Features:

a. Universal T568A and T568B wiring labels.
b. Labeling areas adjacent to conductors.
c. Replaceable connectors.
d. 24 or 48 ports.

2. Construction: 16-gauge steel and mountable on 19-inch (483 mm) equipment racks.
3. Number of Jacks per Field: One for each four-pair **cable indicated**.

E. Patch Cords: Factory-made, four-pair cables in **36-inch (900-mm)**lengths; terminated with an eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.

F. Plugs and Plug Assemblies:

1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Standard: Comply with TIA-568-C.2.

G. Jacks and Jack Assemblies:

1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Designed to snap-in to a patch panel or faceplate.
3. Standard: Comply with TIA-568-C.2.

H. Faceplate:

1. **Four** port, vertical single gang faceplates designed to mount to single gang wall boxes.
2. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
3. Metal Faceplate: **Stainless steel**, complying with requirements in Section 262726 "Wiring Devices."
4. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.

    a. Flush mounting jacks, positioning the cord at a 45-degree angle.

I. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.6 CABLE MANAGEMENT SYSTEM

A. Description: Computer-based cable management system, with integrated database capabilities.

B. Document physical characteristics by recording the network, TIA details, and connections between equipment and cable.

C. Information shall be presented in database view**, schematic plans, or technical drawings**.

1. **Microsoft Visio Professional or AutoCAD** drawing software shall be used as drawing and schematic plans software.

D. System shall interface with the following testing and recording devices:

1. Direct upload tests from circuit testing instrument into the personal computer.
2. Direct download circuit labeling into labeling printer.

2.7 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.8 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with TIA-607-B.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test cables on reels according to TIA-568-C.1.

C. Factory test twisted pair cables according to TIA-568-C.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 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters **and except in accessible ceiling spaces, attics, and 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 Section 270528 "Pathways for Communications Systems."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.

3.2 INSTALLATION OF PATHWAYS

A. Comply with requirements for demarcation point, cabinets, and racks specified in Section 271100 "Communications Equipment Room Fittings."

B. Comply with Section 270528 "Pathways for Communications Systems."

C. Comply with Section 270529 "Hangers and Supports for Communications Systems."

D. Comply with Section 270536 "Cable Trays for Communications Systems."

E. Drawings indicate general arrangement of pathways and fittings.

3.3 INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES

A. Comply with NECA 1 and NECA/BICSI 568.

B. General Requirements for Cabling:

1. Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
2. Comply with BICSI's "Information Transport Systems Installation Methods Manual (ITSIMM), Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Do not untwist twisted pair cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. MUTOA shall not be used as a cross-connect point.
7. Consolidation points may be used only for making a direct connection to equipment outlets:

    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 twisted-pair cables at least 49 feet (15 m) from communications equipment room.

8. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
9. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
10. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI Information Transport Systems Installation Methods Manual , Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.

11. 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.
12. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
13. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
14. Pulling Cable: Comply with BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend twisted pair cabling, not in a wireway or pathway, a minimum of 8 inches (200 mm) above ceilings by cable supports not more than [**60 inches (1524 mm)**] apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable [**6 feet (1800 mm)**] long not less than [**12 inches (300 mm)**] in diameter below each feed point.

E. Group connecting hardware for cables into separate logical fields.

F. Separation from EMI Sources:

1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper 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 (127 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (600 mm).

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 (64 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).

c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

4. Separation between communications cables in grounded metallic raceways, 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 (76 mm).
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with "Firestopping Systems" Article in BISCI's "Telecommunications Distribution Methods Manual."

3.5 GROUNDING

A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.

D. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

1. Administration Class: **Class 1**.
2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification shall comply with TIA-606-B for [**Class 2**] [**Class 3**] [**Class 4**] level of administration[**, including optional identification requirements of this standard**].

C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

E. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) 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 the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
4. 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, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
    b. Label each unit and field within distribution racks and frames.

5. 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.

F. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections[**with the assistance of a factory-authorized service representative**].

E. Tests and Inspections:

1. Visually inspect 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-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

F. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.

G. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

H. End-to-end cabling will be considered defective if it does not pass tests and inspections.

I. Prepare test and inspection reports.

3.8 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning with Substantial Completion, provide software support for **two** years.

B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within **two** years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide **30** days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

END OF SECTION 271513