NOTICE TO BIDDERS

SMALL BUSINESS RESERVE PROCUREMENT

This is a Small Business Reserve Procurement for which award will be limited to Certified Small Business vendors. Only businesses that meet the statutory requirements set forth in State Finance and Procurement Article, §§ 14-501 - 14-505, Annotated Code of Maryland, and who are registered with the Department of General Services Small Business Reserve Program are eligible for award of a contract.

For the purposes of a Small Business Reserve Procurement, a small business is a business, other than a broker, that meets the following criteria:

- The business is independently owned and operated;
- The business is not a subsidiary of another business;
- The business is not dominant in its field of operation;
- The wholesale operations of the business did not employ more than 50 persons, and the gross sales of the business did not exceed an average of $4,000,000 in its most recently completed 3 fiscal years;*
- The retail operations of the business did not employ more than 25 persons, and the gross sales of the business did not exceed an average of $3,000,000 in its most recently completed 3 fiscal years;*
- The manufacturing operations of the business did not employ more than 100 persons, and the gross sales of the business did not exceed an average of $2,000,000 in its most recently completed 3 fiscal years;*
- The service operations of the business did not employ more than 100 persons, and the gross sales of the business did not exceed an average of $10,000,000 in its most recently completed 3 fiscal years;* and
- The construction operations of the business did not employ more than 50 persons, and the gross sales of the business did not exceed an average of $7,000,000 in its most recently completed 3 fiscal years.*
- The architectural and engineering services of the business did not employ more than 100 persons and the gross sales of the business did not exceed an average of $4,500,000 in its most recently completed 3 fiscal years.

* If a business has not existed for three years, the gross sales average shall be the average for each year or part of a year during which the business has been in existence.

Further information on the certification/registration process is available at e-Maryland Marketplace.
INVITATION FOR BIDS

PRETTYMAN & SCARBOROUGH BATHROOM RENOVATIONS

TU-1942-SBR

PROSPECTIVE BIDDERS/OFFERORS WHO OBTAINED THIS DOCUMENT FROM THE UNIVERSITY’S WEBSITE, E-MARYLAND MARKETPLACE, OR ANY SOURCE OTHER THAN THE PROCUREMENT OFFICER, SHOULD PROVIDE THEIR NAMES AND EMAIL ADDRESSES TO THE ISSUING OFFICE BY CONTACTING (410) 704-2171, TO ENSURE RECEIPT OF ADDENDA AND OTHER COMMUNICATIONS REGARDING THE SOLICITATION.

ISSUING OFFICE
PROCUREMENT DEPARTMENT
8000 YORK ROAD
TOWSON, MD 21252-0001

NOTE:
IF YOU PLAN TO HAND DELIVER YOUR BID/PROPOSAL OR USE AN OVERNIGHT COURIER, DELIVER THE BID TO THE PROCUREMENT OFFICE LOCATION TO ENSURE TIMELY DELIVERY.

PROCUREMENT OFFICE LOCATION
ADMINISTRATION BUILDING
7720 YORK ROAD, 4TH FLOOR
TOWSON, MD 21204

FREE 20-MIN. PARKING METERS ARE AVAILABLE NEAR THE 1ST-FLOOR BUILDING ENTRANCE

DIRECTIONS TO THE UNIVERSITY AND A CAMPUS MAP
http://www.towson.edu/maps/index.html

PARKING INFORMATION
http://www.towson.edu/parking/visitors/index.html

MINORITY BUSINESSES ARE ENCOURAGED TO RESPOND TO THIS SOLICITATION
KEY INFORMATION SUMMARY SHEET
Invitation for Bids (IFB)
TU-1942-SBR – Prettyman & Scarborough Bathroom Renovations

IFB Issue Date: 1/29/19

IFB Issuing Office: Towson University Procurement Department

Procurement Officer Representative: Michelle Compton
Phone: 410-704-2050
Fax: 410-704-8233
e-mail: MLCompton@towson.edu

Procurement Office Location: Towson University
Procurement Department
Administration Building, 4th Floor
7720 York Road
Towson, MD 21204

Pre-Bid/Proposal Conference: 2/5/19 – 10:00 AM – 1st site visit immediately following
Pre-Bid/Proposal Conference
Administration Building, Room 408

2nd Site Visit: 2/7/19 @ 1:00 PM
Meet in the 1st Floor Lobby of the Administration Building

Note: One site visit is mandatory

Deadline for Questions: 2/19/19 – 4:30 PM

Bids Due: 2/26/19 – 2:00 PM
(public bid opening)
Administration Building, Room 408

Contract Term: 05/28/19 – 08/02/19

The University is committed to ensuring that persons with disabilities have equally effective opportunities to participate in and benefit from the University's programs and services. Persons who may require reasonable ADA accommodations should contact the Issuing Office at 410-704-2171 at least five (5) days prior to any meeting scheduled in connection with this solicitation.
UNIVERSITY SYSTEM OF MARYLAND
TOWSON UNIVERSITY
NOTICE TO BIDDERS/OFFERORS

To help improve the quality of bid and proposal solicitations and to make our procurement process more responsive and "business friendly," we ask that you provide comments and suggestions regarding the enclosed solicitation. Please return your comments with your bid, proposal or "no bid," response, as the case may be. Thank you for your assistance.

Bid/Proposal Number: ____________ Entitled: ______________________________________

I. If you have responded with a "no bid" please indicate the reasons below:
   ( ) Other commitments preclude our participation at this time.
   ( ) The subject of the solicitation is not something we normally provide.
   ( ) We are inexperienced in the work/commodities required.
   ( ) The specifications are either unclear or too restrictive (Explain below).
   ( ) The scope of work is beyond our current capacity.
   ( ) Doing business with Maryland Government agencies is simply too complicated (Explain below).
   ( ) We cannot be competitive (Explain below).
   ( ) Time allotted for completion of the bid/proposal response is insufficient.
   ( ) Startup time is insufficient.
   ( ) Bonding/Insurance requirements are prohibitive (Explain below).
   ( ) MBE requirements (Explain below)
   ( ) Bid/Proposal requirements (other than specifications or scope) are unreasonable or too risky (Explain below).
   ( ) Prior experience with Towson University contracts was unprofitable or otherwise unsatisfactory (Explain below).
   ( ) Payment schedule too slow.
   ( ) Other: ____________________________________________________________________

II. If you have submitted a bid or proposal, but wish to offer suggestions or express concerns, please use the remarks section below.

Remarks: ____________________________________________________________________

____________________________________________________________________________

Offeror Name: ________________________________________________________________
Contact Person: ________________________________________________________________
Signature: ____________________________ Date: _________________________
Address: ____________________________________________________________________
E-Mail: ____________________________________________________________________
Telephone: ____________________________ Fax: ____________________________
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TERMS AND CONDITIONS
ATTACHMENT A
SECTION I. PROCUREMENT OBJECTIVE

A. SUMMARY STATEMENT
Towson University is seeking qualified Contractors to renovate the restrooms within Prettyman and Scarborough Halls Residence Halls.

B. ISSUING OFFICE AND PROCUREMENT OFFICER
The sole point of contact in the State for purposes of this IFB is the Procurement Officer or his/her representative (hereinafter referred to as Procurement Officer) noted on the Key Information Summary Sheet. Only the information communicated by the Procurement Officer shall be deemed the official position of the University; no other State or University employee, official, or representative has authority to change the requirements of this solicitation. Attempts by Bidder to contact the requester, evaluator, or otherwise circumvent this procedure in any manner may be grounds for disqualification.

C. PRE-BID CONFERENCE AND SITE VISIT
1. Prior to submitting its bid, each contractor is encouraged to attend the scheduled pre-bid conference to examine the facility and familiarize himself with the full nature and extent of the work to be done. They shall obtain for themselves all information that may be necessary for the satisfactory performance of the contract work and the cost thereof. It is the sole responsibility of the contractor to fully familiarize themselves with the areas involved and the extent of the services required by visual inspection. Failure to visit the site and become familiar with the conditions and requirements affecting the work will not relieve the successful contractor from the provisions of the contract and from completing the work for the consideration set forth.

2. Two (2) site visits are scheduled and listed on the Key Information Summary Sheet. Please note: in order to be considered for award one (1) site visit is mandatory.

3. Towson University is committed to ensuring that persons with disabilities are given an equally effective opportunity to participate in and benefit from the university's programs and services. Persons with disabilities who might need reasonable accommodations should contact the Procurement Department at least 72 hours before any meetings held in connection with this solicitation at (410) 704-2171.

D. QUESTIONS AND INQUIRIES
Bidders shall direct all communications regarding this solicitation to the Procurement Officer, in writing (email preferred), not later than the date indicated on the Key Information Summary Sheet. Addenda, if required, will be furnished to all potential Bidders known to have received the IFB.

E. SITE INVESTIGATION
By submitting a bid the vendor acknowledges that he has investigated and satisfied himself as to the conditions affecting the work, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, and electric power. Any failure by the contractor to acquaint himself with the available information will not relieve him from responsibility for estimating properly the cost of successfully performing the work. The University shall not be responsible for any
conclusions or interpretations made by the contractor of the information made available by the University.

F. INSURANCE
Upon award, the successful bidder shall furnish certificates of insurance as required in Exhibit A, Required Contract Provisions, Section 51, naming Towson University as an additional insured. The certificate shall reflect the number and title of the solicitation/contract.

G. BID SECURITY
1. If the total Bid Price is $100,000.00 or more, each Bidder shall furnish with his bid price a "bid bond" (See Exhibit H) issued by a surety company licensed to issue bonds in the State of Maryland. The bond must be in an amount not less than five percent (5%) of the total amount of the base bid price and shall be in the form specified with the bid documents.

2. Certified checks, cash and other security in that amount are acceptable in lieu of a "bid bond", and shall be submitted with the Bid Price and subject to the same conditions as a bond.

3. Should the Bidder to whom the contract is awarded fail or be unable to execute the contract, for any reason, within ten (10) days after notification of award, then an amount equal to the difference between the accepted price, and that of the bidder to whom the award subsequently is made shall be paid to the University as liquidated damages.

4. The Bidder to whom a contract in excess of $100,000.00 is awarded also must furnish Performance and Payment Bonds (See Exhibits I and J), each in the amount of one hundred percent (100%) of the contract price, including executed Change Orders, in the form specified with the bid documents. These must be provided at the time of the signing of the contract and prior to the start of any work.

5. Bid Bonds remain in effect a minimum of ninety (90) days from the bid due date.

H. LICENSES AND QUALIFICATIONS
1. Construction contractors must be licensed as Md. Code Ann., Bus: Reg. § 17-601, and shall submit proof of current licensing with the bid.

2. The University reserves the right to require that a contractor demonstrate that it has the skills, equipment and other resources to satisfactorily perform the nature and magnitude of work necessary to complete the project within the proposed contract schedule.

I. BID DUE DATE
Bids must be received at the Issuing Office by date and time indicated on the Key Information Summary Sheet. Requests for extensions will not be granted. Late bids, late requests for modification, or late requests for withdrawal will not be considered. Unless specifically requested, bids submitted by fax or other electronic devices will be rejected. It is recommended that bids be hand delivered.
J. OPENING OF BIDS
A public opening will be held at the date, time and location noted on the Key Information Summary Sheet.

K. DURATION OF BID OFFER
Bids submitted are irrevocable for 90 days after the bid due date. This period may be extended by mutual written agreement between the bidder and the University.

L. PROCUREMENT METHOD
This solicitation shall be conducted in accordance with the provisions of the University System of Maryland (USM) Procurement Policies and Procedures. The procurement method is Competitive Sealed Bidding.

M. AWARD
The University will recommend for award a responsive bid from the responsible bidder submitting the most favorable evaluated bid price for the requirement(s) herein.

N. MULTIPLE BID OR ALTERNATE BIDS
Unless multiple or alternate bids are specifically requested in the solicitation, they will not be accepted.

O. MINORITY BUSINESS ENTERPRISE UTILIZATION
An overall MBE subcontract participation goal of 29 percent of the total contract dollar amount has been established for this procurement. This percentage of the total dollar amount includes:

- A sub goal of 8 percent of the total contract dollar amount to be allocated to certified minority business enterprises classified as African American-owned businesses.
- A sub goal of 3 percent of the total contract dollar amount to be allocated to certified minority business enterprises classified as Hispanic-owned businesses.
- A sub goal of 3 percent of the total contract dollar amount to be allocated to certified minority business enterprises classified as Asian-owned businesses.

By submitting a response to this solicitation, the bidder or offeror agrees that these percentages of the total dollar amounts of the contract will be performed by certified minority business enterprises as specified.

♦ A prime contractor — including an MBE prime contractor — must accomplish an amount of work not less than the MBE subcontract goal with certified MBE subcontractors.

♦ A prime contractor comprising a joint venture that includes MBE partner(s) must accomplish the MBE subcontract goal with certified MBE subcontractors.

Note: Per Exhibit E, Attachment 1A, when a certified MBE firm participates as a prime contractor on a Contract, a procurement agency may count the distinct, clearly-defined portion of the work of the Contract that the certified MBE firm performs with its own workforce toward fulfilling up to, but no more than, fifty-percent (50%) of the overall MBE
P. LIQUIDATED DAMAGES PROVISION RELATED TO MBE GOAL

This contract requires the Contractor to make good faith efforts to comply with the Minority Business Enterprise (“MBE”) Program and contract provisions. The University and the Contractor acknowledge and agree that the University will incur damages, including but not limited to, loss of goodwill, detrimental impact on economic development and diversion of internal staff resources if the Contractor does not make good faith efforts to comply with the requirements of the MBE Program and MBE contract provisions. The parties further acknowledge and agree that the damages the University might reasonably anticipate to accrue as a result of such lack of compliance are difficult to ascertain with precision.

Therefore, upon a determination by the University that the Contractor failed to make good faith efforts to comply with one or more of the specified MBE Program requirements or contract provisions, the Contractor agrees to pay liquidated damages to the University at the rates set forth below. The Contractor expressly agrees that the University may withhold payment on any invoices as a set-off against liquidated damages owed. The Contractor further agrees that for each specified violation, the agreed upon liquidated damages are reasonably proximate to the loss the University is anticipated to incur as a result of such violation.

a. Failure to submit each monthly payment report in full compliance with COMAR 21.11.03.13B (3): $24.93 per day until the monthly report is submitted as required.

b. Failure to include in its agreements with MBE subcontractors a provision requiring submission of payment reports in full compliance with COMAR 21.11.03.13B (4): $ 87.24 per MBE subcontractor.

c. Failure to comply with COMAR 21.11.03.12 in terminating, canceling, or changing the scope of work/value of a contract with an MBE subcontractor and/or amendment of the MBE participation schedule: the difference between the dollar value of the MBE participation commitment on the MBE participation schedule for that specific MBE firm and the dollar value of the work performed by that MBE firm for the contract.

d. Failure to meet the Contractor’s total MBE participation goal and sub-goal commitments: the difference between the dollar value of the total MBE participation commitment on the MBE participation schedule and the MBE participation actually achieved.

Notwithstanding the use of liquidated damages, the University reserves the right to terminate the contract and exercise all other rights and remedies provided in the contract or by law.

END OF SECTION I.
SECTION II. GENERAL INFORMATION FOR VENDORS

A. PURPOSE
The overall purpose of this solicitation is to provide information to vendors interested in preparing and submitting bids to meet the requirements herein. Bidders shall familiarize themselves with each section and subsection of this document.

B. REVISIONS TO IFB
1. The University reserves the right to amend this solicitation at any time prior to the bid due date. If it becomes necessary to amend any part of this solicitation, the procurement officer will furnish addenda to all prospective bidders known to have received a copy of this IFB.

2. Each bidder shall acknowledge the receipt of all addenda issued by completing Exhibit K, Addendum Acknowledgment Form, and enclosing it with the bid.

C. PRE-BID MODIFICATION OR WITHDRAWAL OF OFFERS
Bids may be modified or withdrawn by written notice received at the Issuing Office before the bid opening date and time.

D. CANCELLATION OF SOLICITATION/REJECTION OF ALL BIDS
The University reserves the right to cancel this IFB, to accept or reject any or all bids, in whole or in part, received in response to this IFB, and to waive or permit cure of minor irregularities as its best interests may require.

E. INCURRED EXPENSES
The University assumes no responsibility for expenses incurred in preparing and submitting bids in response to this solicitation.

F. ARREARAGES
By submitting a response to this solicitation, a bidder represents that it is not in arrears in the payment of any obligation due and owing the State of Maryland, including the payment of taxes and employee benefits, and that it shall not become so in arrears during the term of the contract if selected for contract award.

G. VERIFICATION OF REGISTRATION AND TAX PAYMENT
Each prospective bidder is encouraged to ensure that it is appropriately registered to do business in the State of Maryland, and in good standing with respect to taxes, personal property returns, unemployment insurance, etc., before the bid opening date. Failure to complete registration with the State Department of Assessments and Taxation (SDAT) may disqualify an otherwise successful bidder from recommendation for contract award.

H. ECONOMY OF PREPARATION
Bids should be prepared simply and economically, providing a straight-forward, concise description of the bidder's ability to fulfill the requirements of this solicitation.

I. PUBLIC INFORMATION ACT NOTICE
Bidder shall give specific attention to identification of those portions of its bid considered confidential, or containing proprietary information or trade secrets. Upon request, bidder shall provide justification why such material should not be disclosed by the University.
under the Public Information Act, General Provisions Article, §§ 4-401 et seq., Annotated Code of Maryland.

J. EXECUTION OF BIDS
Bids shall be typewritten or written legibly in ink, and signed in ink as follows, depending on the bidder’s form of business organization:

1. **Sole Proprietorship.** Proprietor shall sign full name, with address.

2. **Partnership and Joint Venture.** Submit the bid/price proposal form in the name of the partnership or joint venture. Clearly state the partnership name and the identity of each general partner, and execute all affidavits and certificates on behalf of the partnership, or on behalf of each general partner. No provision of any agreement among partners will be binding on the University unless it is disclosed in the Bidder’s proposal. Reasonable evidence satisfactory to the University of the authority of one partner to bind other purported partners is required. Include a copy of the partnership agreement, if one exists. If no partnership agreement exists, and if the number of general partners is reasonably small, each general partner should execute all required documents. At the University’s option, all general partners may be required to sign. Failure to present the University with satisfactory information concerning a purported partnership or joint venture may be grounds for bid rejection.

3. **Corporation.** An officer or authorized agent of the corporation shall sign with full name, indicate title, and include the name and address of the corporation. In the case of an authorized agent, enclose a letter from an officer of the corporation authorizing said individual to act on behalf of the corporation.

K. DISCREPANCIES, EXPLANATIONS AND CLARIFICATIONS
Bidders finding discrepancies in the specifications or other provisions included in this solicitation, or in doubt as to the meaning or intent of any section or subsection herein, shall request clarification from the Procurement Officer. Failure to request clarification prior to the due date shall be a waiver of any claim by the Bidder for expenses made necessary by reason of later interpretation of the contract documents, and Bidder shall be bound to the University’s interpretation. Request clarifications in accordance with the instructions above.

L. ORDER OF PRECEDENCE
The contract to be entered into as a result of the IFB (the "Contract") will consist of the following contract documents listed in their order of precedence:

1. The contract executed by the parties and/or Purchase Order issued by the University;

2. The solicitation, including Exhibit A-2 Required Contract Provisions for Construction/Maintenance, and all other Exhibits; and

3. The bid, as submitted by bidder and accepted by the University.

No modifications to this order of precedence will be accepted.
M. REQUIRED CONTRACT PROVISIONS
Bids submitted, and contract(s) executed with the successful bidder, are subject to Exhibit A and Exhibit A-1 (if applicable).

By submitting a bid, the vendor is deemed to have accepted the terms of this IFB, including exhibits; a bid that takes exception to the terms of the IFB may be rejected. Mutually agreeable modifications of the solicitation provisions, if allowed by law, will be documented by express identification in the final contract as superseding the pertinent provisions of the solicitation.

N. FALSE STATEMENTS
Bidders are advised that the Annotated Code of Maryland provides that in connection with a procurement contract, a person may not willfully: Falsify, conceal or suppress a material fact by any scheme or device; make a false or fraudulent statement or representation of a material fact; use a false writing or document that contains a false or fraudulent statement or entry of a material fact; or aid or conspire with another person to commit any of the aforementioned acts. A person who violates these provisions is guilty of a felony, and on conviction is subject to a fine not exceeding $20,000 or imprisonment not exceeding five (5) years, or both.

O. PAYMENT TO THE CONTRACTOR
Payment is governed by Title 15, Subtitle 1, of the State Finance and Procurement Article, Annotated Code of Maryland. The State of Maryland is exempt from Maryland Retail Sales tax and Federal Excise Tax.

If the contract is a maintenance service/service contract, at the end of each calendar month, the Contractor shall render to the Accounts Payable Office, its invoice, in triplicate, for work done during the month. The amount shall not exceed one-twelfth (1/12) of the yearly service contract, unless otherwise specified in the Detailed Specifications.

P. VENDOR ELECTRONIC FUNDS TRANSFER REGISTRATION
Contractors of the State are required to complete a COT/GAD Form X-10, Vendor Electronic Funds Transfer (EFT) Registration Request Form, for each new contract with a value greater than $200,000. Vendors must register for EFT by submitting a completed COT/GAD Form X-10 to the Comptroller's General Accounting Division (GAD) or request an exemption from GAD. The revised form is on the Comptroller's Web site at http://compnet.comp.state.md.us/General_Accounting_Division/Vendors/Electronic_Funds_Transfer/default.shtml

Q. RECIPROCAL PREFERENCE
While Maryland law does not authorize state agencies to favor resident bidders, other states grant preferences to their residents over Maryland businesses. Therefore, a resident business preference may be given to a Maryland firm if: A responsible bidder whose headquarters, principal base of operations, or principal site that will provide the services required by this IFB is located in another state submits the most advantageous offer; the other state gives a preference to its residents through law, policy, or practice; and the preference does not conflict with a Federal law or grant affecting the contract. The preference given shall be identical to the preference that the other state gives to its residents.
R. NON-VISUAL ACCESS
The Contractor shall ensure compliance in any applicable contract with State of Maryland IT Non-Visual Access Standards. The standards should be incorporated to the fullest extent possible for information technology contracts. These standards/policies may be revised from time to time and the Contractor shall comply with all such revisions. The Non-visual Access Clause noted in COMAR 21.05.08.05 and referenced in the IFB is the basis for the standards that have been incorporated in the Maryland regulations.

S. PARKING
All vehicles parked on Towson University property must strictly observe University parking regulations. Each vehicle parked on campus between 6 am and 8 pm, Monday through Thursday, and from 6 am to 3 pm on Fridays, must display a valid University permit unless parked at a paid meter. Parking on sidewalks or unpaved areas is prohibited at all times. All fines for parking or other vehicle violations are the responsibility of the Contractor. This applies to vendors, salespersons, company vehicles, and Contractor employees’ personal vehicles. Long- and short-term permits are available, at designated rates, for vendors with contracts that require them to park regularly on the campus; see the parking website at http://www.towson.edu/parking/visitors/index.html for permit rates and information to support preparation of Bid/Price Proposal. Parking Transportation phone: (410) 704-7275. NOTE: INCLUDE PARKING FEES IN BID/PRICE PROPOSAL.

T. SMOKING
Smoking, defined as the burning of tobacco or any other material in any type of smoking equipment, including but not restricted to cigarettes, cigars or pipes, is prohibited on all property owned, leased or operated by the University. This consists of all buildings, including residence halls, leased restaurants and lodging facilities; all grounds, including exterior open spaces, parking lots and garages, on-campus sidewalks, streets, driveways, stadiums, recreational spaces and practice facilities; and in all University-owned or leased vehicles. The policy applies to all individuals on the University campus, including faculty, staff, students, parents, vendors and visitors. Contractor and its employees and subcontractors who violate the policy may be denied access to the University campus.

END OF SECTION II.
SECTION III. BID SUBMISSION REQUIREMENTS

A. ORGANIZATION OF BIDS
1. Bids must be submitted to the campus location of the Issuing Office not later than the date and time indicated on the Key Information Summary Sheet.
2. Submit one (1) clearly marked original and one (1) copy of each bid, in a sealed envelope. Indicate on the outside of the envelope the solicitation/project number, bid due date, and bidder’s name and address.
3. If technical data, product literature, or brochures are needed to supplement the bid, enclose those materials after the last required form.
4. Bids that are incomplete or that deviate from the format required in this section may be rejected.

B. SUBMITTAL REQUIREMENTS CHECKLIST
Each bid must include the following:
1. BID/PRICE PROPOSAL FORM, typewritten or completed in ink and executed in accordance with the requirements in Section II. Each alteration to the Bid Form must be initialed, in ink, by the signatory.
2. Exhibit B, BID/PROPOSAL AFFIDAVIT, typewritten or completed in ink and executed in accordance with the requirements in Section II.
3. Attachment 1A, from Exhibit E, MINORITY BUSINESS UTILIZATION PACKAGE.
4. Exhibit F, COMPANY PROFILE
5. Exhibit G, FIRM EXPERIENCE. Duplicate as necessary to furnish references for no less than three (3) comparable projects completed within the past five (5) years, or currently underway.

C. EVIDENCE OF BIDDER RESPONSIBILITY
The University may require any bidder to furnish additional information regarding past performance, financial capacity, technical expertise, or other qualifications bearing on
performance of the contract, and reserves the right to consider any information otherwise available, or to make such additional investigations as it deems necessary to confirm the responsibility of any bidder.

The Procurement Officer shall make purchases from, and award contracts, only to responsible contractors. In the absence of information clearly indicating that the prospective contractor is responsible, the Procurement Officer shall make a determination of non-responsibility.

END OF SECTION III.
Scope of Work
TU-1942-SBR
Prettyman & Scarborough Bathroom Renovation Project

I. General:
Towson University is seeking qualified Contractors to renovate the restrooms within Prettyman and Scarborough Halls Residence Halls. The project will include renovating 10 large gang restrooms, which includes lavatories, water closets and showers, and 6 restrooms, which include lavatories and water closets. This project includes removing finishes, plumbing fixtures, piping, lighting etc. as indicated in the construction documents. The finishes, lighting, plumbing fixtures and piping will be replaced to the extent indicated on the construction documents.

II. Schedule:
Work on this project shall take place between May 28, 2019 and August 2, 2019

III. Additional Information:
During this period, the water will be turned off to both Prettyman and Scarborough residence halls to allow the bathroom renovation work to occur. The bathroom renovation Contractor should plan accordingly and provide temporary restrooms for its’ workers which are to be located outside the Prettyman and Scarborough residence halls.

Fire Protection: The sprinkler piping is being renovated to accommodate the new restroom layout and new dropped ceiling. The work will be performed by BFPE outside the scope of this contract but during this renovation. The contractor is responsible to coordinate with TU project manager and BFPE to allow for the renovation of the sprinkler piping to occur during the renovation of the bathroom. This includes providing scheduling assistance for when the sprinkler work is to occur in conjunction with this project.
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SECTION 011000

SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work by Owner.
5. Access to site.
6. Coordination with occupants.
7. Work restrictions.
8. Specification and Drawing conventions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Prettyman / Scarborough Toilet / Shower Room Renovations.

1. Project Location: Towson University

B. Owner: Towson University.

C. Architect: LSY Architects.

D. Architect's Consultants: Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. MEP Engineer
2. Structural Engineer

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:
   1. Renovation of selected toilet rooms and shower room located in the Prettyman and Scarborough Dormitories.

B. Type of Contract:
   1. Project will be constructed under a single prime contract.

1.5 WORK BY OWNER

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

B. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with Work under this Contract.
   1. The owner will be engaging a contractor to complete the upgrading of the sprinkler system to accommodate the new layout.
   2. The owner will be engaging a contractor to complete the design and installation of FA devices throughout the project.

1.6 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   1. Limits: Confine construction operations to the area indicated on the drawings and laydown spaces agreed to with the owner.
   2. Driveways, Walkways and Entrances: Keep driveways and walkways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.7 COORDINATION WITH OCCUPANTS

A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.

2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

1.8 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

2. The weekend and evening work need to be approved and coordinated with TU Project Manager prior.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7 a.m. to 5 p.m., Monday through Friday, unless otherwise indicated. Weekend and evening work needs to be approved and coordinated with TU project manager.

1. Weekend Hours: 8 am to 5 pm on Saturday, 9 am to 5 pm on Sunday.

2. Early Morning Hours: No early morning hours

3. Hours for Utility Shutdowns:

4. Hours for Core Drilling: No limits, building is unoccupied.
C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Restricted Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

F. Employee Identification: Owner will provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000
SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section includes administrative and procedural requirements for substitutions.
   B. Related Requirements:
      1. 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.
      2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.
1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

   a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
   b. Substitution request is fully documented and properly submitted.
   c. Requested substitution will not adversely affect Contractor's construction schedule.
   d. Requested substitution has received necessary approvals of authorities having jurisdiction.
   e. Requested substitution is compatible with other portions of the Work.
   f. Requested substitution has been coordinated with other portions of the Work.
   g. Requested substitution provides specified warranty.
   h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500
SECTION 013200
CONSTRUCTION PROGRESS 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 documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor’s Construction Schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Unusual event 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 Activity: An activity on the critical path that 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. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.

C. 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.
D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.
   1. Float time belongs to Owner
   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.

G. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
   1. Working electronic copy of schedule file, where indicated.
   2. PDF file.
   3. Two paper copies, of sufficient size to display entire period or schedule, as required.

B. Startup construction schedule.
   1. Submittal of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
   1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.

E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, 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 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 each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

F. Construction Schedule Updating Reports: Submit with Applications for Payment.

G. Daily Construction Reports: Submit at weekly intervals.

H. Material Location Reports: Submit at weekly intervals.

I. Site Condition Reports: Submit at time of discovery of differing conditions.

J. Unusual Event Reports: Submit at time of unusual event.

K. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "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 work stages, area separations and interim milestones.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.
1.6 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, list of
subcontracts, submittal schedule, progress reports, payment requests, and other
required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from
entities involved.
2. Coordinate each construction activity in the network with other activities and
schedule them in proper sequence.

1.7 CONTRACTOR’S CONSTRUCTION SCHEDULE, GENERAL

A. Computer Scheduling Software: Prepare schedules using current version of a program
that has been developed specifically to manage construction schedules.

1. Use Microsoft Project, for current Windows operating system.

B. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and
reporting using CPM scheduling.

1. In-House Option: Owner may waive requirement to retain a consultant if
Contractor employs skilled personnel with experience in CPM scheduling and
reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project
progress, alleged delays, and time impact.

C. Time Frame: Extend schedule from date established for the Notice to Proceed to date
of 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.

D. Activities: Treat each floor or separate area as a separate numbered activity for each
main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless
specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following
long lead items and major items, requiring a cycle of more than 60 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 resubmittal times indicated in
Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review
times in Contractor's Construction Schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
5. **Substantial Completion**: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.

6. **Punch List and Final Completion**: Include not more than 30 days for completion of punch list items and final completion.

E. **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. **Products Ordered in Advance**: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.

2. **Work Restrictions**: Show the effect of the following items on the schedule:
   a. Coordination with existing construction.
   b. Limitations of continued occupancies.
   c. Uninterruptible services.
   d. Partial occupancy before Substantial Completion.
   e. Use-of-premises restrictions.
   g. Seasonal variations.
   h. Environmental control.

3. **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. Building flush-out.
   m. Startup and placement into final use and operation.

4. **Construction Areas**: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
   a. Structural completion.
b. Temporary enclosure and space conditioning.
c. Permanent space enclosure.
d. Completion of mechanical installation.
e. Completion of electrical installation.
f. Substantial Completion.

F. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion, and the following interim milestones:

1. Temporary enclosure and space conditioning.

G. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

H. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and the Contract Time.

I. Contractor’s Construction Schedule Updating: At weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule two days before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

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

K. Distribution: Distribute copies of approved schedule to Architect and Owner and other parties identified by Contractor with a need-to-know schedule responsibility.

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

1.8 STARTUP CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for the Notice of Award.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 30 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.9 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 7 days of date established for the Notice of Award.

1. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.10 CPM SCHEDULE REQUIREMENTS

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

B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice of Award. Outline significant construction activities for the first 30 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a time-scaled CPM network analysis diagram for the Work.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 7 days after date established for the Notice of Award.
   
a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates.

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

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

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

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

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
   
a. Preparation and processing of submittals.
b. Mobilization and demobilization.
c. Purchase of materials.
d. Delivery.
e. Fabrication.
f. Utility interruptions.
g. Installation.
h. Work by Owner that may affect or be affected by Contractor's activities.
i. Testing and inspection.
j. Commissioning.
k. Punch list and final completion.
l. Activities occurring following final completion.

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

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

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

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

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

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
10. Dollar value of activity (coordinated with the schedule of values).

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

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
5. Changes in the critical path.
6. Changes in total float or slack time.

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

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.

b. Submit value summary printouts one week before each regularly scheduled progress meeting.
1.11 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
8. Accidents.
9. Meetings and significant decisions.
10. Unusual events.
11. Stoppages, delays, shortages, and losses.
12. Meter readings and similar recordings.
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. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

D. Unusual Event Reports: 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, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

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.
4. Preconstruction video recordings.
5. Periodic construction video recordings.

B. Related Requirements:

1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
2. Section 024119 "Selective Demolition" for photographic documentation before selective demolition operations commence.

1.3 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within three days of taking photographs.

1. Submit photos on CD-ROM or thumb-drive. Include copy of key plan indicating each photograph's location and direction.
2. Identification: Provide the following information with each image description in file metadata tag.
   a. Name of Project.
   b. Name of Architect.
c. Name of Contractor.
d. Date photograph was taken.
e. Description of location, vantage point, and direction.
f. Unique sequential identifier keyed to accompanying key plan.

1.4 QUALITY ASSURANCE

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

B. Construction Webcam Service Provider: A firm specializing in providing photographic equipment, web-based software, and related services for construction projects, with record of providing satisfactory services similar to those required for Project.

1.5 FORMATS AND MEDIA

A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels, and with vibration-reduction technology. Use flash in low light levels or backlit conditions.

B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

C. Metadata: Record accurate date and time and GPS location data from camera.

D. File Names: Name media files with date and Project area and sequential numbering suffix.

1.6 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified photographer to take construction photographs.

B. General: Take photographs with maximum depth of field and in focus.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Preconstruction Photographs: Before commencement of demolition and starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points.

D. Periodic Construction Photographs: Take 20 photographs weekly coinciding 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.
E. Final Completion Construction Photographs: Take 20 photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

1. Three days' notice will be given, where feasible.
2. In emergency situations, take additional photographs within 24 hours of request.
3. 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. These photographs are not subject to unit prices or unit-cost allowances.
   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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013233
SECTION 013300
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Submittal schedule requirements.
   2. Administrative and procedural requirements for submittals.

B. Related Requirements:
   1. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
   2. Section 013233 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and final completion construction photographs.
   3. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
   4. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
   5. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
1.4 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

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

2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

   a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

   a. Scheduled date for first submittal.
   b. Specification Section number and title.
   c. Submittal Category: Action; informational.
   d. Name of subcontractor.
   e. Description of the Work covered.
   f. Scheduled date for Architect's final release or approval.
   g. Scheduled dates for purchasing.
   h. Scheduled date of fabrication.
   i. Scheduled dates for installation.
   j. Activity or event number.

1.5 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
4. Name of Construction Manager.
5. Name of Contractor.
6. Name of firm or entity that prepared submittal.
7. Names of subcontractor, manufacturer, and supplier.
8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
9. Category and type of submittal.
10. Submittal purpose and description.
11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
12. Drawing number and detail references, as appropriate.
13. Indication of full or partial submittal.
14. Location(s) where product is to be installed, as appropriate.
15. Other necessary identification.
17. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

1.6 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Email: Prepare submittals as PDF package, and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.


B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections so processing will not be delayed because of need to review submittals concurrently for coordination.
a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect’s receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.7 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.

3. Include the following information, as applicable:
   a. Manufacturer's catalog cuts.
   b. Manufacturer's product specifications.
   c. Standard color charts.
   d. Statement of compliance with specified referenced standards.
   e. Testing by recognized testing agency.
   f. Application of testing agency labels and seals.
   g. Notation of coordination requirements.
   h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams that show factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.
   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of coordination requirements.
   e. Notation of dimensions established by field measurement.
   f. Relationship and attachment to adjoining construction clearly indicated.
   g. Seal and signature of professional engineer if specified.

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
a. Project name and submittal number.
b. Generic description of Sample.
c. Product name and name of manufacturer.
d. Sample source.
e. Number and title of applicable Specification Section.
f. Specification paragraph number and generic name of each item.

3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

   a. Samples 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.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

   a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

6. 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.

   a. Number of Samples: Submit three sets of Samples. Architect will retain one. Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.

      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.
D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of
compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

   a. Name of evaluation organization.
   b. Date of evaluation.
   c. Time period when report is in effect.
   d. Product and manufacturers’ names.
   e. Description of product.
   f. Test procedures and results.
   g. Limitations of use.

1.8 CONTRACTOR’S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Contractor’s Approval: Indicate Contractor’s approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.
1.9 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.

   1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Architect will return without review submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

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

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect and 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. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
C. **Installer/Applicator/Erector:** Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a 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).

D. **Mockups:** Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. **Room Mockups:** Mockups of typical interior spaces complete with wall, floor, and ceiling finishes; doors; windows; millwork; casework; specialties; furnishings and equipment; and lighting.

E. **Preconstruction Testing:** Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

F. **Product Tests:** Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

G. **Source Quality-Control Tests:** Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.

H. **Testing Agency:** An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. **Quality-Assurance Services:** Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

J. **Quality-Control Services:** Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor’s quality-control services do not include contract administration activities performed by Architect.
1.4 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements are specified and the standards or requirements 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 direction before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 ACTION SUBMITTALS

A. Shop Drawings: For mockups.

1. Include plans, sections, and elevations, indicating materials and size of mockup construction.
2. Indicate manufacturer and model number of individual components.
3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

B. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.7 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

F. Reports: Prepare and submit certified written reports and documents as specified.

G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's Construction Schedule.

B. Quality-Control Personnel Qualifications: Engage qualified 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. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.

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.

1.9 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.
B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.10 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. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that 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 inspection indicated, as documented according to ASTM E329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

H. 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.

I. 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.

J. 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.
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.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
5. Demonstrate the proposed range of aesthetic effects and workmanship.
6. Obtain Architect's approval of mockups before starting corresponding work, fabrication, or construction.
   a. Allow seven days for initial review and each re-review of each mockup.
7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
8. Demolish and remove mockups when directed unless otherwise indicated.

L. Room Mockups: Construct room mockups according to approved Shop Drawings incorporating required materials and assemblies, finished according to requirements. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work. Comply with requirements in "Mockups" Paragraph.

M. Provide room mockups of the following rooms:

1. One Toilet / Shower Room – Shower Area and Lavatory Area

1.11 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2. Payment for these services will be made from testing and inspection allowances, as authorized by Change Orders.
3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Engage a qualified testing agency to perform quality-control services.
   a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.


1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation,
including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Associated Contractor Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, Architect testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.
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.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000
SECTION 014200

REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. 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. The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents.

8. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
16. AIA - American Institute of Architects (The); www.aia.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
49. CDA - Copper Development Association; www.copper.org.
51. CEA - Canadian Electricity Association; www.electricity.ca.
52. CEA - Consumer Electronics Association; www.ce.org.
54. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
56. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
59. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
61. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
63. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
66. CSI - Construction Specifications Institute (The); www.csinet.org.
68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
69. CWC - Composite Wood Council; (See CPA).
71. DHI - Door and Hardware Institute; www.dhi.org.
72. ECA - Electronic Components Association; (See ECIA).
73. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
75. EIA - Electronic Industries Alliance; (See TIA).
78. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
79. ESTA - Entertainment Services and Technology Association; (See PLASA).
80. ETL - Intertek (See Intertek); www.intertek.com.
82. FCI - Fluid Controls Institute; www.fluidcontrols institute.org.
83. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
84. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
86. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
90. GA - Gypsum Association; www.gypsum.org.
92. GS - Green Seal; www.greenseal.org.
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<tr>
<th>Reference</th>
<th>Organization Name</th>
<th>Website</th>
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<tr>
<td>94.</td>
<td>HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).</td>
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<td>95.</td>
<td>HMMA - Hollow Metal Manufacturers Association; (See NAAMM).</td>
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<td>96.</td>
<td>HPVA - Hardwood Plywood &amp; Veneer Association; <a href="http://www.hpva.org">www.hpva.org</a></td>
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<td>97.</td>
<td>HPW - H. P. White Laboratory, Inc.; <a href="http://www.hpwhite.com">www.hpwhite.com</a></td>
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<td>98.</td>
<td>IAPSC - International Association of Professional Security Consultants; <a href="http://www.iapsc.org">www.iapsc.org</a></td>
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<td>99.</td>
<td>IAS - International Accreditation Service; <a href="http://www.iasonline.org">www.iasonline.org</a></td>
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<td>100.</td>
<td>ICBO - International Conference of Building Officials; (See ICC).</td>
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<td>101.</td>
<td>ICC - International Code Council; <a href="http://www.iccsafe.org">www.iccsafe.org</a></td>
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<td>102.</td>
<td>ICEA - Insulated Cable Engineers Association, Inc.; <a href="http://www.ieca.net">www.ieca.net</a></td>
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<td>103.</td>
<td>ICPA - International Cast Polymer Alliance; <a href="http://www.icpa-hq.org">www.icpa-hq.org</a></td>
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<td>104.</td>
<td>ICRI - International Concrete Repair Institute, Inc.; <a href="http://www.icri.org">www.icri.org</a></td>
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<td>105.</td>
<td>IEC - International Electrotechnical Commission; <a href="http://www.iec.ch">www.iec.ch</a></td>
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<td>106.</td>
<td>IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); <a href="http://www.ieee.org">www.ieee.org</a></td>
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<td>107.</td>
<td>IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); <a href="http://www.ies.org">www.ies.org</a></td>
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<td>108.</td>
<td>IESNA - Illuminating Engineering Society of North America; (See IES).</td>
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<td>109.</td>
<td>IEST - Institute of Environmental Sciences and Technology; <a href="http://www.iest.org">www.iest.org</a></td>
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<td>110.</td>
<td>IGMA - Insulating Glass Manufacturers Alliance; <a href="http://www.igmaonline.org">www.igmaonline.org</a></td>
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<td>111.</td>
<td>IGSHPA - International Ground Source Heat Pump Association; <a href="http://www.igshpa.okstate.edu">www.igshpa.okstate.edu</a></td>
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<td>112.</td>
<td>ILI - Indiana Limestone Institute of America, Inc.; <a href="http://www.iliai.com">www.iliai.com</a></td>
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<td>113.</td>
<td>Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); <a href="http://www.intertek.com">www.intertek.com</a></td>
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<td>114.</td>
<td>ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); <a href="http://www.isa.org">www.isa.org</a></td>
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<td>115.</td>
<td>ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).</td>
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<td>116.</td>
<td>ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); <a href="http://www.isfanow.org">www.isfanow.org</a></td>
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<td>117.</td>
<td>ISO - International Organization for Standardization; <a href="http://www.iso.org">www.iso.org</a></td>
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<td>118.</td>
<td>ISSFA - International Solid Surface Fabricators Association; (See ISFA).</td>
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<td>119.</td>
<td>ITU - International Telecommunication Union; <a href="http://www.itu.int/home">www.itu.int/home</a></td>
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<td>120.</td>
<td>KCMA - Kitchen Cabinet Manufacturers Association; <a href="http://www.kcma.org">www.kcma.org</a></td>
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<td>121.</td>
<td>LMA - Laminating Materials Association; (See CPA).</td>
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<td>122.</td>
<td>LPI - Lightning Protection Institute; <a href="http://www.lightning.org">www.lightning.org</a></td>
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<td>123.</td>
<td>MBMA - Metal Building Manufacturers Association; <a href="http://www.mbma.com">www.mbma.com</a></td>
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<td>124.</td>
<td>MCA - Metal Construction Association; <a href="http://www.metalconstruction.org">www.metalconstruction.org</a></td>
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<td>125.</td>
<td>MFMA - Maple Flooring Manufacturers Association, Inc.; <a href="http://www.maplefloor.org">www.maplefloor.org</a></td>
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<td>126.</td>
<td>MFMA - Metal Framing Manufacturers Association, Inc.; <a href="http://www.metalframingmfg.org">www.metalframingmfg.org</a></td>
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<td>127.</td>
<td>MHIA - Material Handling Industry of America; <a href="http://www.mhia.org">www.mhia.org</a></td>
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<td>128.</td>
<td>MIA - Marble Institute of America; <a href="http://www.marble-institute.com">www.marble-institute.com</a></td>
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<td>129.</td>
<td>MMPA - Moulding &amp; Millwork Producers Association; <a href="http://www.wmmpa.com">www.wmmpa.com</a></td>
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<td>130.</td>
<td>MPI - Master Painters Institute; <a href="http://www.paintinfo.com">www.paintinfo.com</a></td>
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<td>131.</td>
<td>MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; <a href="http://www.mss-hq.org">www.mss-hq.org</a></td>
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<tr>
<td>132.</td>
<td>NAAMM - National Association of Architectural Metal Manufacturers; <a href="http://www.naamm.org">www.naamm.org</a></td>
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133. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
138. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
139. NCMA - National Concrete Masonry Association; www.ncma.org.
140. NECA - National Electrical Contractors Association; www.necanet.org.
144. NFHS - National Federation of State High School Associations; www.nfhs.org.
146. NFPA - NFPA International; (See NFPA).
149. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
151. NRCA - National Roofing Contractors Association; www.nrca.net.
152. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
156. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
158. PCI - Precast/Prestressed Concrete Institute; www pci.org.
159. PDI - Plumbing & Drainage Institute; www.pdionline.org.
160. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
165. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
166. SDI - Steel Deck Institute; www.sdi.org.
167. SDI - Steel Door Institute; www.steeldoor.org.
168. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
169. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
171. SJI - Steel Joist Institute; www.steeljoist.org.
172. SMA - Screen Manufacturers Association; www.smainfo.org.
173. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
REFERENCES

176. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
177. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
186. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
189. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
190. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
192. TPI - Truss Plate Institute; www.tpinst.org.
196. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
197. USAV - USA Volleyball; www.usavolleyball.org.
202. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
203. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
204. WDMA - Window & Door Manufacturers Association; www.wdma.com.
207. WWPA - Western Wood Products Association; www.wwpa.org.

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

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of
the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

5. DOE - Department of Energy; [www.energy.gov](http://www.energy.gov).
6. EPA - Environmental Protection Agency; [www.epa.gov](http://www.epa.gov).
13. SD - Department of State; [www.state.gov](http://www.state.gov).
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; [www.ars.usda.gov](http://www.ars.usda.gov).
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; [www.ojp.usdoj.gov](http://www.ojp.usdoj.gov).

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; [www.access-board.gov](http://www.access-board.gov).
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhtfi.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservce.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to Architect, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
1.4 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

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

C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold.

F. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
   1. Locations of dust-control partitions at each phase of work.
   2. HVAC system isolation schematic drawing.
   3. Location of proposed air-filtration system discharge.
   5. Other dust-control measures.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

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

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.
PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Field Offices, General: Owner will provide conditioned interior space for field offices for duration of Project.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
   1. Store combustible materials apart from building.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
   1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
   1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1. Toilets: Use of Owner's existing toilet 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 Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

E. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

F. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
3.4 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

D. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
   a. Provide temporary, directional signs for construction personnel and visitors.
3. Maintain and touch up signs so they are legible at all times.

E. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

H. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
I. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 011000 "Summary."

C. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

D. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

F. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

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

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
H. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

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

3.6 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

3.7 OPERATION, TERMINATION, AND REMOVAL

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

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

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.

2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Salvaging nonhazardous demolition and construction waste.
   2. Recycling nonhazardous demolition and construction waste.
   3. Disposing of nonhazardous demolition and construction waste.

1.3 DEFINITIONS

A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.

C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner’s property.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.
1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 7 days of date established for the Notice of Award.

1.6 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons (tonnes).
4. Quantity of waste salvaged, both estimated and actual in tons (tonnes).
5. Quantity of waste recycled, both estimated and actual in tons (tonnes).
6. Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Qualification Data: For waste management coordinator.

1.7 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste management coordination of projects with similar requirements. Superintendent may or may not serve as Waste Management Coordinator.

B. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference(s): Conduct conference(s) at Project site to Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of each contractor and waste management coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.8 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste. Include points of waste generation, total
quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
3. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there were no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste and Form CWM-6 for demolition waste. Include the following:

1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include transportation and tipping fees and cost of collection containers and handling for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
7. Savings in transportation and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total nonhazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1. Demolition Waste:
   a. Concrete masonry units.
   b. Wood studs.
   c. Plywood and oriented strand board.
   d. Wood trim.
e. Structural and miscellaneous steel.
f. Rough hardware.
g. Metal studs.
h. Gypsum board.
i. Acoustical tile and panels.
j. Plumbing fixtures.
k. Piping.
l. Supports and hangers.
m. Valves.
n. Sprinklers.
o. Electrical conduit.
p. Copper wiring.
q. Lighting fixtures.
r. Lamps.
s. Ballasts.
t. Electrical devices.

2. Construction Waste:

a. Metals.
b. Gypsum board.
c. Piping.
d. Electrical conduit.
e. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

1) Paper.
2) Cardboard.
3) Boxes.
4) Plastic sheet and film.
5) Polystyrene packaging.
7) Wood pallets.
8) Plastic pails.

f. Construction Office Waste: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following construction office waste materials:

1) Paper.
2) Aluminum cans.
3) Glass containers.
PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

   a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.

4. Store components off the ground and protect from the weather.

5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

3.3 RECYCLING DEMOLITION WASTE

A. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

B. Metals: Separate metals by type.

   1. Structural Steel: Stack members according to size, type of member, and length.
   2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

D. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

E. Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.

F. Conduit: Reduce conduit to straight lengths and store by material and size.

G. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.
3.4 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
   a. Comply with requirements in Section 329300 "Plants" for use of clean sawdust as organic mulch.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
   a. Comply with requirements in Section 329300 "Plants" for use of clean ground gypsum board as inorganic soil amendment.

D. Paint: Seal containers and store by type.

3.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. General: Except for items or materials to be salvaged or recycled, remove waste materials and legally dispose of at designated spoil areas on Owner's property.

C. Burning: Do not burn waste materials.
D. Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

END OF SECTION 017419
SECTION 017700
CLOSEOUT PROCEDURES

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
      1. Substantial Completion procedures.
      2. Final completion procedures.
      3. Warranties.
      4. Final cleaning.
      5. Repair of the Work.
   B. Related Requirements:
      1. Section 013233 "Photographic Documentation" for submitting final completion construction photographic documentation.
      2. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
      3. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of cleaning agent.
   B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
   C. Certified List of Incomplete Items: Final submittal at final completion.

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

1.5 MAINTENANCE MATERIAL SUBMITTALS
A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES
A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number.
   a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner's signature for receipt of submittals.
5. Submit testing, adjusting, and balancing records.
6. Submit sustainable design submittals not previously submitted.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

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

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final
inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order,
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
   a. Project name.
   b. Date.
   c. Name of Architect.
   d. Name of Contractor.
   e. Page number.

4. Submit list of incomplete items in the following format:

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
1. Submit by email to Architect.

E. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

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

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

   a. Clean Project site in areas disturbed by construction activities of rubbish, waste material, litter, and other foreign substances.
   b. Remove tools, construction equipment, machinery, and surplus material from Project site.
   c. Clean interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
   d. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
e. Vacuum carpet and similar soft surfaces, removing debris and excess nap; 
clean according to manufacturer's recommendations if visible soil or stains 
remain.
f. Remove labels that are not permanent.
g. Clean plumbing fixtures to a sanitary condition, free of stains, including 
stains resulting from water exposure.
h. Clean luminaires, lamps, globes, and reflectors to function with full 
efficiency.
i. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary 
Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in 
Section 015000 "Temporary Facilities and Controls." and Section 017419 "Construction 
Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for 
determination of Substantial Completion.

B. Repair, or remove and replace, defective construction. Repairing includes replacing 
defective parts, refinishing damaged surfaces, touching up with matching materials, 
and properly adjusting operating equipment. Where damaged or worn items cannot be 
repaired or restored, provide replacements. Remove and replace operating 
components that cannot be repaired. Restore damaged construction and permanent 
facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, 
and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and 
surfaces. Replace finishes and surfaces that that already show evidence of repair 
or restoration.
   a. Do not paint over "UL" and other required labels and identification, 
      including mechanical and electrical nameplates. Remove paint applied to 
      required labels and identification.

3. Replace parts subject to operating conditions during construction that may 
   impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and 
defective and noisy starters in fluorescent and mercury vapor fixtures to comply 
   with requirements for new fixtures.

END OF SECTION 017700
SECTION 017823
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory manuals.
2. Emergency manuals.
3. Systems and equipment operation manuals.
4. Systems and equipment maintenance manuals.
5. Product maintenance manuals.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

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

B. Format: Submit operation and maintenance manuals in the following format:

1. Submit by email to Architect. Enable reviewer comments on draft submittals.

C. Initial Manual Submittal: Submit draft copy of each manual at least 15 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.

2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.6 REQUIREMENTS FOR MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
2. Table of contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:

1. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
2. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:
   1. Product name and model number.
   2. Manufacturer's name.
   3. Color, pattern, and texture.
   5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
   1. Inspection procedures.
   2. Types of cleaning agents to be used and methods of cleaning.
   3. List of cleaning agents and methods of cleaning detrimental to product.
   4. Schedule for routine cleaning and maintenance.
   5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823
SECTION 017839
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:

1. Section 017700 "Closeout Procedures" for general closeout procedures.
2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.
2. Number of Copies: Submit copies of record Drawings as follows:
   a. Initial Submittal:
      1) Submit one paper-copy set(s) of marked-up record prints.
      2) Submit PDF electronic files of scanned record prints and one of file prints.
      3) Submit record digital data files and one set(s) of plots.
      4) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
   b. Final Submittal:
1) Submit three paper-copy set(s) of marked-up record prints.
2) Submit PDF electronic files of scanned record prints and three set(s) of prints.
3) Print each drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

E. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.4 RECORD DRAWINGS

A. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
3. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
4. Refer instances of uncertainty to Architect for resolution.

   a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
   b. Architect will provide data file layer information. Record markups in separate layers.

B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

2. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.

3. Identification: As follows:
   a. Project name.
   b. Date.
   c. Designation "PROJECT RECORD DRAWINGS."
   d. Name of Architect.
   e. Name of Contractor.

1.5 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file.

1.6 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.
C. Format: Submit record Product Data as annotated PDF electronic file.
   1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file.
   1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.8 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store record documents in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017839
SECTION 024119
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Demolition and removal of selected portions of building or structure.
   2. Demolition and removal of selected site elements.
   3. Salvage of existing items to be reused or recycled.

B. Related Requirements:
   1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and store.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.


C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property for dust control. Indicate proposed locations and construction of barriers.

D. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

E. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused
by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.

F. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.9 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before selective demolition, Owner will remove the following items:

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.

2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.

F. Storage or sale of removed items or materials on-site is not permitted.

G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.10 WARRANTY
   A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:
   B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.11 COORDINATION
   A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
   A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
   B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Perform engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
   1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Steel Tendons: Locate tensioned steel tendons and include recommendations for detensioning.

E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs.
   1. Comply with requirements specified in Section 013233 "Photographic Documentation."
   2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
   3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
   2. Arrange to shut off utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and components indicated on Drawings to be removed.
   a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
   2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
   3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
   4. Cover and protect furniture, furnishings, and equipment that have not been removed.
   5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
   2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
   3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least 4 hours after flame-cutting operations.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Work in Historic Areas: Selective demolition may be performed only in areas of Project that are not designated as historic. In historic spaces, areas, and rooms, or on historic surfaces, the terms "demolish" or "remove" shall mean historic "removal" or "dismantling" as specified in Section 024296 "Historic Removal and Dismantling."

D. Removed and Salvaged Items:
   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 designated by Owner.
   5. Protect items from damage during transport and storage.

E. Removed and Reinstalled Items:
   1. Clean and repair items to functional condition adequate for intended reuse.
   2. Pack or crate items after cleaning and repairing. Identify contents of containers.
   3. Protect items from damage during transport and storage.
   4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

F. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of
Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119
SECTION 035300
CONCRETE TOPPING

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. Emery-aggregate concrete floor topping.

1.3 PREINSTALLATION MEETINGS
   A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS
   A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS
   A. Product Test Reports: For each concrete floor topping, for tests performed by manufacturer and witnessed by a qualified testing agency
   B. Field quality-control test reports.

1.6 QUALITY ASSURANCE
   A. Testing Agency Qualifications: An independent agency qualified according to ASTM C1077 and ASTM E329 for testing indicated.
1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage, mixing with other components, and application.

B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting concrete floor topping performance.

1. Place concrete floor topping only when ambient temperature and temperature of base slabs are between 50 and 86 deg F (10 and 30 deg C).

B. Close areas to traffic during topping application and, after application, for time period recommended in writing by manufacturer.

PART 2 - PRODUCTS

2.1 CONCRETE FLOOR TOPPINGS

A. Emery-Aggregate Concrete Floor Topping: Factory-prepared and dry-packaged mixture of graded, crushed emery aggregate containing not less than 50 percent aluminum oxide, not less than 24 percent ferric oxide, and not more than 8 percent silica; portland cement or blended hydraulic cement; plasticizers; and other admixtures to which only water needs to be added at Project site.

1. Compressive Strength (28 Days): 10,000 psi (69 MPa); ASTM C109/C109M.

2.2 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.
E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, 25 percent solids content, minimum.

2.3 RELATED MATERIALS

A. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids epoxy resin with a Type A Shore durometer hardness of 80 according to ASTM D2240.

B. Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.

C. Portland Cement: ASTM C150/C150M, Type I or II.

D. Sand: ASTM C404, fine aggregate passing No. 16 (1.18-mm) sieve.

E. Water: Potable.

F. Acrylic-Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

G. Epoxy Adhesive: ASTM C881/C881M, Type V, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements.


2.4 MIXING

A. Bonding Slurry: Mix portland cement with water to a thick paint consistency.

B. Bonding Slurry: Mix 1 part portland cement and 1-1/2 parts sand with water and an acrylic-bonding agent according to manufacturer's written instructions to a thick paint consistency.

C. Floor Topping: Mix concrete floor topping materials and water in appropriate drum-type batch machine mixer or truck mixer according to manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance of the Work.

B. Verify that base concrete slabs comply with scratch finish requirements.
C. Verify that base slabs are visibly dry and free of moisture. Test for capillary moisture by the plastic sheet method according to ASTM D4263.

D. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Existing Concrete: Remove existing surface treatments and deteriorated and unsound concrete. Mechanically abrade base slabs to produce a heavily scarified surface profile with an amplitude of 1/4 inch (6 mm).

1. Prepare and clean existing base slabs according to concrete floor topping manufacturer's written instructions. Fill voids, cracks, and cavities in base slabs.
2. Mechanically remove contaminants from existing concrete that might impair bond of floor topping.
3. Saw cut contraction and construction joints in existing concrete to a depth of 1/2 inch (13 mm) and fill with semirigid joint filler.
4. To both sides of joint edges and at perimeter of existing base slab, mechanically remove a 4-inch- (100-mm-) wide and 0- to 1-inch- (0- to 25-mm-) deep, tapered wedge of concrete and retexture surface.

B. Install joint-filler strips where topping abuts vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with topping surface unless otherwise indicated.
2. Terminate full-width, joint-filler strips 1/2 inch (13 mm) below topping surface where joint sealants are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

C. Install power-actuated fasteners according to written directions of floor topping manufacturer at perimeter of areas that are to receive floor topping, including both edges of locations where joints will be formed in floor topping.

3.3 FLOOR TOPPING APPLICATION

A. Start floor topping application in presence of manufacturer's technical representative.

B. Monolithic Floor Topping: After textured-float finish is applied to fresh concrete of base slabs place concrete floor topping while concrete is still plastic.

C. Deferred Floor Topping: Within 72 hours of placing base slabs, mix and scrub bonding slurry into dampened concrete to a thickness of 1/16 to 1/8 inch (1.6 to 3 mm), without puddling. Place floor topping while slurry is still tacky.
D. Existing Concrete: Apply epoxy-bonding adhesive, mixed according to manufacturer's written instructions, and scrub into dry base slabs to a thickness of 1/16 to 1/8 inch (1.6 to 3 mm), without puddling. Place floor topping while adhesive is still tacky.

E. Place concrete floor topping continuously in a single layer, tamping and consolidating to achieve tight contact with bonding surface. Do not permit cold joints or seams to develop within pour strip.

1. Screed surface with a straightedge and strike off to correct elevations.
2. Slope surfaces uniformly where indicated.
3. Begin initial floating, using bull floats to form a uniform and open-textured surface plane free of humps or hollows.

F. Finishing: Consolidate surface with power-driven floats as soon as concrete floor topping can support equipment and operator. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until concrete floor topping surface has a uniform, smooth, granular texture.

1. Hard Trowel Finish: After floating surface, apply first trowel finish and consolidate concrete floor topping by power-driven trowel without allowing blisters to develop. Continue troweling passes and restraighten until surface is smooth and uniform in texture.

   a. Finish surfaces to specified overall values of flatness, $F(F)$ 25; and of levelness, $F(L)$ 20; with minimum local values of flatness, $F(F)$ 17; and of levelness, $F(L)$ 15, and measure within 24 hours according to ASTM E1155 (ASTM E1155M) for a randomly trafficked floor surface.

   b. Finish and measure surface, so gap at any point between surface and an unleveled freestanding 10-foot- (3-m-) long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed 1/4 inch (6 mm).

G. Construction Joints: Construct joints true to line with faces perpendicular to surface plane of concrete floor topping, at locations indicated or as approved by Architect.

1. Coat face of construction joint with epoxy adhesive at locations where concrete floor topping is placed against hardened or partially hardened concrete floor topping.

H. Contraction Joints: Form weakened-plane contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete floor topping when cutting action will not tear, abrade, or otherwise damage surface and before random contraction cracks develop.

1. Form joints in concrete floor topping over contraction joints in base slabs unless otherwise indicated.
2. Construct contraction joints for a combined depth equal to topping thickness and not less than one-fourth of base-slab thickness.
3. Construct contraction joints for a depth equal to one-half of concrete floor topping thickness, but not less than 1/2 inch (13 mm) deep.

3.4 PROTECTING AND CURING

A. General: Protect freshly placed concrete floor topping from premature drying and excessive cold or hot temperatures.

B. Evaporation Retarder: Apply evaporation retarder to concrete floor topping surfaces in hot, dry, or windy conditions before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying floor topping, but before float finishing.

C. Begin curing immediately after finishing concrete floor topping. Cure by one or a combination of the following methods, according to concrete floor topping manufacturer's written instructions:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with water.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in two coats in continuous operations by power spray or roller according to manufacturer's written instructions. Reccoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.5 JOINT FILLING

A. Prepare and clean contraction joints and install semirigid joint filler, according to manufacturer's written instructions, once topping has fully cured.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth of contraction joints. Overfill joint and trim semirigid joint filler flush with top of joint after hardening.

3.6 REPAIR

A. Defective Topping: Repair and patch defective concrete floor topping areas, including areas that have not bonded to concrete substrate.
3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing and inspecting of completed applications of concrete floor toppings shall take place in successive stages, in areas of extent and using methods as follows:

1. Sample Sets: At point of placement, a set of three molded-cube samples shall be taken from the topping mix for the first 1000 sq. ft. (93 sq. m), plus one set of samples for each subsequent 5000 sq. ft. (464 sq. m) of topping, or fraction thereof, but not less than six samples for each day's placement. Samples shall be tested according to ASTM C109/C109M for compliance with compressive-strength requirements.

2. Concrete floor topping shall be tested for delamination by dragging a steel chain over the surface.

3. Concrete floor topping shall be tested for compliance with surface flatness and levelness tolerances.

C. Remove and replace applications of concrete floor topping where test results indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION 035300
SECTION 035416
HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, general provisions of the Contract, and other related construction documents such as Division 01 specifications apply to this Section.

1.2 SUMMARY

A. This Section includes a concrete topping that contains a blend of Portland cements and other hydraulic cements.

1. ARDEX K 301™ Exterior Self-Leveling Concrete Topping

2. ARDEX EP 2000™ Substrate Preparation Epoxy Primer

3. ARDEX CG Concrete Guard™ or other approved concrete sealer

1.3 REFERENCES

A. ASTM C 109M, Compressive Strength Air-Cure Only

B. ASTM C348, Flexural Strength of Hydraulic-Cement Mortars

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used. Include manufacturer's Material Safety Data Sheets.

B. Qualification Data: For Installer
1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: The manufacturer shall be a company with at least five years experience and regularly engaged in the manufacture and marketing of products specified herein. Contact Manufacturer Representative prior to installation. Installation of the ARDEX product must be completed by a factory-trained installer, certified applicator, such as an ARDEX LevelMaster® Elite or Choice Contractor, using mixing equipment and tools approved by the manufacturer. Contact ARDEX Engineered Cements (724) 203-5000 for a list of recommended installers.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver products in original packaging, labeled with product identification, manufacturer, batch number and shelf life.

B. Store products in a dry area with temperature maintained between 50° and 85° F (10° and 29° C) and Protect from direct sunlight.

C. Handle products in accordance with manufacturer's printed recommendations.

1.7 PROJECT CONDITIONS

A. Do not install material below 50°F (10°C) surface and air temperatures. These temperatures must also be maintained during and for 48 hours after the installation of products included in this section. Install quickly if substrate is warm and follow warm weather instructions available from the ARDEX Technical Service Department.

PART 2 - PRODUCTS

2.1 HYDRAULIC CEMENT UNDERLAYMENT

A. Self-Leveling Concrete Topping

I. Acceptable Products:

a. ARDEX K301™; Manufactured by ARDEX Engineered Cements: 400 Ardex Park Drive, Aliquippa, Pa 15001 USA, (724) 203-5000, www.ardexamericas.com

2. Performance and Physical Properties: Meet or exceed the following values:
   a. Application: Barrel Mix or Pump
   b. Walkable: 2 – 3 hours
   c. Flow Time: 10 minutes
   d. Compressive Strength: 4300 psi at 28 days, ASTM C109M.
   e. Flexural Strength: 1000 psi at 28 days, ASTM C348.
   f. Colors: Light Gray

2.2 WATER: Water shall be clean, potable, and sufficiently cool (not warmer than 70°F).

2.3 SEALER: ARDEX CG Concrete Guard™ or other sealer as specified by architect

PART 3 – EXECUTION

3.1 PREPARATION
   A. Concrete Subfloors: Prepare substrate in accordance with manufacturer’s instructions.
      1. All concrete subfloors must be sound, solid, clean, and free of all oil, grease, dirt, curing compounds and any substance that might act as a bond breaker before priming. Mechanically clean to a minimum ICRI surface profile of CSP 3. Acid etching and the use of sweeping compounds and solvents are not acceptable.
   B. Joint and Crack Preparation:
      1. All Joints and Moving Cracks – Under no circumstances should ARDEX K301™ be installed over any joints or moving cracks. All joints and moving cracks may be filled with ARDEX ARDISEAL™ Rapid Plus Semi-Rigid Joint Sealant.

3.2 APPLICATION OF ARDEX K301™
   A. Examine substrates and conditions under which materials will be installed. Do not proceed with installation until unsatisfactory conditions are corrected.
   B. Coordinate installation with adjacent work to ensure proper sequence of construction. Protect adjacent areas from contact due to mixing and handling of materials.
   C. Priming:
1. Install ARDEX EP 2000™ Substrate Preparation Epoxy Primer. Apply the freshly mixed epoxy to the prepared surface using a short-nap paint roller or notched squeegee with back rolling for smoother surfaces and a longer nap for more uneven substrates. ARDEX EP 2000™ can also be worked into the surface with a paintbrush for hard to reach areas and corners.

   a. While in a fresh state, broadcast in excess of fine sand (less than 1/50" in grain size or 98.5% passing sieve size #30 or #35) consistently over the entire area. After 16 hours, broom sweep and vacuum the surface to remove all loose sand.

D. Mixing: Comply with manufacturer’s printed instructions and the following.

   1. ARDEX K 301 is mixed two bags at a time. Mix each 50 lb. (22.7 kg) bag with 5 quarts (4.73 L) of clean water.

   2. Mix using a ½” (12 mm) heavy-duty mixing drill (650 rpm) with an ARDEX T-1 mixing paddle. Do not overwater.

   3. Aggregate mix: For areas with thicknesses greater than 3/4" (19 mm), aggregate may be added to reduce material costs. Mix ARDEX K301™ with water first, then add 1 part aggregate by volume of washed, well-graded pea gravel aggregate (1/8" to 3/8" ; 3 to 9.5 mm). Do not use sand. If the aggregate is wet, reduce the amount of water to avoid overwatering. Note: The addition of aggregate will diminish the workability of the product and may make it necessary to install a finish coat to obtain a smooth surface. ARDEX recommends a finish coat to obtain a smooth surface. Allow the initial application to dry for 24 hours, and then prime this layer with ARDEX EP 2000 and sand broadcast. All the primer to dry 16 hours before removing all excess sand and installing the neat coat of ARDEX K 301.

   4. For pump installations, ARDEX K301™ shall be mixed using the ARDEX ARDIFLO™ Automatic Mixing Pumps. Contact ARDEX Technical Service Department (724) 203- 5000 for complete pump operation instructions.

E. Application: Comply with manufacturer’s printed instructions and the following.

   1. ARDEX K301™ may be installed at a minimum thickness of 1/4" (6 mm) up to ¾" (19 mm) over large areas neat and up to 2" (5 cm) with the addition of proper aggregate. ARDEX K 301

   2. Pour or pump the liquid ARDEX K301™ onto the substrate and spread in place with the ARDEX T-4 Spreader. Immediately smooth the material with the ARDEX T-5 Smoother. Wear non-metallic cleats to avoid leaving marks in the liquid ARDEX K301™.
F. Curing

1. Although ARDEX K301™ requires no special curing procedures, avoid applying this product if rain is expected within 6 to 8 hours, or if freezing temperatures could occur within 48 hours of application. As with any cementitious material, the above conditions can alter the appearance and performance of the topping.

G. Sealing

1. The surface of ARDEX K301™ must always be protected from oil, salt, water and surface wear by applying a suitable protection system. ARDEX recommends the use of ARDEX CG Concrete Guard™ to seal ARDEX K301™ that will be exposed to normal foot traffic.

2. For areas to receive heavier traffic, sealing should be done using an appropriate wear protection coating. As the performance of the coating systems varies greatly, the installer is responsible for assessing the suitability of these coatings.

   a. If ARDEX CG Concrete Guard™ or a waterborne sealer is to be applied at a thickness not-to-exceed a total of 20 mil (500 microns), the coating can be applied to the surface of the ARDEX K301™ after 24 hours at 70°F (21°C).

   b. When using a solvent-borne or 100% solids coating applied at a total thickness of 20 mils (500 microns) or less, the ARDEX K301™ must cure for a minimum of 48 – 72 hours at 70°F (21°C).

   c. When the total application thickness will exceed 20 mils (500 microns), the ARDEX K301™ must cure 7 days at 70°F (21°C) prior to installing the protection layer.

3.3 FIELD QUALITY CONTROL

A. Where specified, field sampling of the Ardex topping is to be done by taking an entire unopened bag of the product being installed to an independent testing facility to perform compressive strength testing in accordance with ASTM C 109/modified: air-cure only. There are no in situ test procedures for the evaluation of compressive strength.

END OF SECTION 035416
SECTION 061053
MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Wood blocking and nailers.
2. Plywood backing panels.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.

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. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency according to ASTM D5664.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:
   1. Preservative-treated wood.
   2. Fire-retardant-treated wood.
   4. Post-installed 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. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent or unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall 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 does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat all miscellaneous carpentry unless otherwise indicated.
   1. Wood blocking, stripping, and similar concealed members in contact with masonry or concrete.

### 2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

   1. Treatment shall not promote corrosion of metal fasteners.
   2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
   3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
   4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664, and design value adjustment factors shall be calculated according to ASTM D6841.

C. Kiln-dry lumber after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat all miscellaneous carpentry unless otherwise indicated:
1. Concealed blocking.
2. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.

B. Concealed Boards: 15 percent maximum moisture content of any of the following species and grades:

1. Mixed southern pine or southern pine, No. 2 grade; SPIB.
2. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
4. Eastern softwoods, No. 2 Common grade; NELMA.
5. Northern species, No. 2 Common grade; NLGA.
6. Western woods, Construction or No. 2 Common grade; 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.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

B. Nails, Brads, and Staples: ASTM F1667.
C. Screws for Fastening to Metal Framing: ASTM C1002, length as recommended by screw manufacturer for material being fastened.

D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.7 METAL FRAMING ANCHORS

A. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 (Z180) coating designation.

1. Use for interior locations unless otherwise indicated.

B. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; 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 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.

1. Use for wood-preservative-treated lumber and where indicated.

C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304.

1. Use for exterior locations and where indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA’s WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

D. Install metal framing anchors to comply with manufacturer’s written instructions. Install fasteners through each fastener hole.

E. Do not splice structural members between supports unless otherwise indicated.

F. 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 (406 mm) o.c.

G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal (38-mm actual) thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.

H. Sort and select lumber so that natural characteristics do 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. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

K. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

2. 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.
3. ICC-ES evaluation report for fastener.

L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
3.2 INSTALLATION OF WOOD BLOCKING AND NAILER

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) 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 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 miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053
SECTION 092216
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

B. Evaluation Reports: For embossed, high-strength steel studs and tracks from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association or the Steel Stud Manufacturers Association.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 by an independent testing agency.

B. Horizontal Deflection: For non-composite wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft. (239 Pa).

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.


B. Studs and Tracks: ASTM C645. Use either conventional steel studs and tracks or embossed, high-strength steel studs and tracks.

1. Steel Studs and Tracks:
   a. Minimum Base-Steel Thickness: As indicated on Drawings.
   b. Depth: As indicated on Drawings.

2. Embossed, High Strength Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally comparable to conventional ASTM C645 steel studs and tracks.
   a. Minimum Base-Steel Thickness: As indicated on Drawings
   b. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing 1-1/2-inch (38-mm) minimum vertical movement.

2. Single Long-Leg Track System: ASTM C645 top track with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs
friction fit into top track and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.

3. Double-Track System: ASTM C645 top outer tracks, inside track with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.

4. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

D. Cold-Rolled Channel Bridging: Steel, 0.0538-inch (1.367-mm) minimum base-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

E. Hat-Shaped, Rigid Furring Channels: ASTM C645.

1. Minimum Base-Steel Thickness: As indicated on Drawings
2. Depth: As indicated on Drawings

F. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.
2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch (0.8 mm).
3. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (610 mm) o.c.

2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754.

1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C841 that apply to framing installation.

2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C1063 that apply to framing installation.

3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C844 that apply to framing installation.

4. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
2. Multilayer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
3. Tile Backing Panels: As required by horizontal deflection performance requirements unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
   a. Install two studs at each jamb unless otherwise indicated.
   b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
   c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
   a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

6. Curved Partitions:
   a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
   b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches (150 mm) o.c.

E. Direct Furring:
   1. Screw to wood framing.
   2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

END OF SECTION 092216
SECTION 092900
GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Interior gypsum board.
   2. Tile backing panels.

B. Related Requirements:
   1. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
   2. Section 093013 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:
   1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

C. Samples for Initial Selection: For each type of trim accessory indicated.

D. Samples for Verification: For the following products:
   1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.
1.4 QUALITY ASSURANCE

A. Mockups: Build mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockups for the following:
   a. Each level of gypsum board finish indicated for use in exposed locations.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer’s written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
2.2 INTERIOR GYPSUM BOARD

A. Abuse-Resistant Gypsum Board: ASTM C1396/C1396M gypsum board, tested according to ASTM C1629/C1629M.

1. Core: As indicated on Drawings
2. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
3. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
5. Long Edges: Tapered.
6. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.3 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.

1. Thickness: 5/8 inch (15.9 mm).
2. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
   a. Cornerbead.
   b. Bullnose bead.
   c. LC-Bead: J-shaped; exposed long flange receives joint compound.
   d. L-Bead: L-shaped; exposed long flange receives joint compound.
   e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
   f. Expansion (control) joint.
   g. Curved-Edge Cornerbead: With notched or flexible flanges.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use setting-type, sandable topping compound.
   4. Finish Coat: For third coat, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:
   1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
   2. Cementitious Backer Units: As recommended by backer unit manufacturer.
   3. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
   1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
   2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

D. Vapor Retarder: As specified in Section 072600 "Vapor Retarders."
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations.
and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Abuse-Resistant Type: All gypsum board is to be abuse resistant throughout

B. Single-Layer Application:

1. On partitions/walls, apply gypsum panels unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

2. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at area that are to receive ceramic tile finish.

B. Water-Resistant Backing Board: Install where indicated with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.

C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer’s written instructions.

B. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:

1. Level 4: [At panel surfaces that will be exposed to view unless otherwise indicated].
   a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

3.8 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900
SECTION 093013
CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Ceramic tile.
2. Porcelain tile.
3. Glazed wall tile.
5. Waterproof membrane for thinset applications.
6. Crack isolation membrane.
7. Metal edge strips.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
2. Section 092900 "Gypsum Board" for cementitious backer units.
3. Section 093023 "Glass Mosaic Tiling."

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.


C. Face Size: Actual tile size, excluding spacer lugs.
D. Module Size: Actual tile size plus joint width indicated.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.
D. Samples for Verification:
   1. Full-size units of each type and composition of tile and for each color and finish required.
   2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 36 inches (900 mm) square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
   3. Full-size units of each type of trim and accessory for each color and finish required.
   4. Stone thresholds in 6-inch (150-mm) lengths.
   5. Metal edge strips in 6-inch (150-mm) lengths.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.
B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
C. Product Certificates: For each type of product.
D. Product Test Reports: For tile-setting and -grouting products and certified porcelain tile.
1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer is a Five-Star member of the National Tile Contractors Association
2. Installer’s supervisor for Project holds the International Masonry Institute's Foreman Certification.
3. Installer employs only Ceramic Tile Education Foundation Certified Installers for Project.
4. Installer employs at least one installer for Project that has completed the Advanced Certification for Tile Installers (ACT) certification for installation of membranes, gauged porcelain tile/gauged porcelain tile panels and slabs and large format tile.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of each type of floor tile installation.
2. Build mockup of each type of wall tile installation.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.
1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer’s written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.

1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.

2. Obtain waterproof membrane crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:

1. Stone thresholds.

2. Waterproof membrane.

3. Crack isolation membrane.

4. Cementitious backer units.

5. Metal edge strips.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards
referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.3 TILE PRODUCTS

A. Ceramic Tile Type **CT-1**: Factory-mounted glazed ceramic tile.

1. Dal-Tile 0100 Rittenhouse, White
2. Composition: Porcelain
3. Certification: Porcelain tile certified by the Porcelain Tile Certification Agency.
4. Module Size: 3 by 6 inch
5. Thickness: 5/16”
6. Face: Plain with cushion edges.
7. Surface: Smooth, without abrasive admixture.
8. Dynamic Coefficient of Friction: N/A.
10. Tile Color and Pattern: As indicated by manufacturer's designations
11. Grout Color: As selected by Architect from manufacturer's full range
12. Trim: As Indicated on Drawings

B. Mosaic Tile Type **CT-2**: Unglazed / Glazed Mosaic Tile

1. ConestogaTile PA Bliss, NS340 SPA
2. Face Size: 12 by 12-inch sheet
3. Thickness: 3/8 inch (9.5 mm)
4. Wearing Surface: Nonabrasive, smooth
5. Dynamic Coefficient of Friction: N/A.
6. Finish: Mosaic of glazed, unglazed, stone, metal and glass
7. Tile Color and Pattern: As indicated by manufacturer's designations
8. Grout Color: As selected by Architect from manufacturer's full range
9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

C. Mosaic Tile Type **CT-3**: Unglazed / Glazed Mosaic Tile
1. ConestogaTile PA Bliss, NS350 SPA
2. Face Size: 12 by 12-inch sheet
3. Thickness: 3/8 inch (9.5 mm)
4. Wearing Surface: Nonabrasive, smooth
5. Dynamic Coefficient of Friction: N/A.
6. Finish: Mosaic of glazed, unglazed, stone, metal and glass
7. Tile Color and Pattern: As indicated by manufacturer's designations
8. Grout Color: As selected by Architect from manufacturer's full range.
9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

D. Ceramic Tile Type **CT-4**: Glazed porcelain tile.

1. Architectural Ceramics, On Square, Cemento, Lappato
2. Certification: Tile certified by the Porcelain Tile Certification Agency.
3. Face Size: 12 by 24 inches
4. Face Size Variation: Rectified.
5. Thickness: 3/8 inch (9.5 mm).
6. Face: As indicated.
7. Dynamic Coefficient of Friction: Not less than 0.51.
8. Tile Color, Glaze, and Pattern: As indicated by manufacturer's designations
9. Grout Color: As selected by Architect from manufacturer's full range.
10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

2.4 **THRESHOLDS**

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.

B. Marble Thresholds: ASTM C503/C503M, with a minimum abrasion resistance of 12 according to ASTM C1353 or ASTM C241/C241M and with honed finish.

1. Description: Uniform, fine- to medium-grained white stone with gray veining.
2. Description: Match Architect's sample.
2.5 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch (0.2-mm) nominal thickness.

2.6 CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch (0.2-mm) nominal thickness.

2.7 SETTING MATERIALS

A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.

1. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
2. Provide prepackaged, dry-mortar mix combined with liquid-latex additive at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.8 GROUT MATERIALS

A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.


C. High-Performance Tile Grout: ANSI A118.7.

1. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.
2. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.
2.9 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D4397, 4.0 mils (0.1 mm) thick.

C. Metal Edge Strips: Refer to drawings for specifications

D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

E. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

2.10 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

   a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION OF CERAMIC TILE

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:

   a. Tile floors in wet areas.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in
items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in pattern indicated on drawings. Retain first subparagraph below for mounted tile.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Ceramic Mosaic Tile: 1/8 inch (3.2 mm).
2. Glazed Wall Tile: 1/8 inch (3.2 mm).
3. Porcelain Tile: 1/4 inch (6.4 mm).

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. Set thresholds in modified dry-set mortar (thinset).
2. Do not extend waterproof membrane or crack isolation membrane under thresholds set in modified dry-set mortar. Fill joints between such thresholds and adjoining tile set on waterproof membrane or crack isolation membrane with elastomeric sealant.

K. Metal Edge Strips: Install at locations indicated.

L. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.
3.4 INSTALLATION OF TILE BACKING PANEL
   A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.5 INSTALLATION OF WATERPROOF MEMBRANE
   A. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
   B. Allow waterproof membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.6 INSTALLATION OF CRACK ISOLATION MEMBRANE
   A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
   B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.7 ADJUSTING AND CLEANING
   A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
   B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
      1. Remove grout residue from tile as soon as possible.
      2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.8 PROTECTION
   A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.9 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Ceramic Tile Installation CT-4: TCNA F122; thinset mortar on waterproof membrane.
   a. Ceramic Tile Type: Porcelain.
   b. Thinset Mortar: Modified dry-set mortar.

2. Ceramic Tile Installation CT-4: TCNA F125-Full thinset mortar on crack isolation membrane.
   a. Ceramic Tile Type: CT-4.
   b. Thinset Mortar: Modified dry-set mortar.

B. Shower Receptor and Wall Installations:

1. Ceramic Tile Installation CT-1, CT-2 and CT-3: TCNA B415; thinset mortar on waterproof membrane over cementitious backer units or fiber-cement backer board.
   a. Ceramic Tile Type: Porcelain, Mosaic.
   b. Thinset Mortar: Modified dry-set mortar.

END OF SECTION 093013
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 tiles for interior ceilings.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, 6 inches (150 mm) in size.

C. Samples for Initial Selection: For components with factory-applied finishes.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:

1. Acoustical Tiles: Set of full-size Samples of each type, color, pattern, and texture.
2. Exposed Moldings and Trim: Set of 6-inch- (150-mm-) long Samples of each type and color.

E. Delegated-Design Submittal: For seismic restraints for ceiling systems.
1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Ceiling suspension-system members.
   2. Structural members to which suspension systems will be attached.
   3. Method of attaching hangers to building structure.
      a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
   4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
   5. Size and location of initial access modules for acoustical tile.
   6. Items penetrating finished ceiling and ceiling-mounted items including the following:
      a. Lighting fixtures.
      b. Grilles.
      c. Sprinklers.
      d. Perimeter moldings.

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical tile ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Evaluation Reports: For each acoustical tile ceiling suspension system and anchor and fastener type, from ICC-ES.

E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.
1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size tiles equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each concealed grid and exposed component equal to 2 percent of quantity installed.

1.8 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical ceiling area as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles, suspension-system components, and accessories to Project site 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 tiles, permit them to reach room temperature and a stabilized moisture content.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weathertight, 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.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical tile ceiling installation.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations:

1. Suspended Acoustical Tile Ceilings: Obtain each type of acoustical ceiling tile and its suspension system from single source from single manufacturer.
2. Directly Attached Acoustical Tile Ceilings: Obtain each type of acoustical ceiling tile from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraints for ceiling systems.

B. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

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-Spread Index: Class A according to ASTM E1264.
2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL TILES: ATC-1

A. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E1264 classifications as designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

B. Classification: Provide tiles as follows:

1. Type and Form: Type IV, Form 2
2. Pattern: E (lightly textured)

C. Color: As selected from manufacturer's full range.

D. Light Reflectance (LR): Not less than 0.86.

E. Ceiling Attenuation Class (CAC): Not less than 35

F. Noise Reduction Coefficient (NRC): Not less than .85

G. Articulation Class (AC): Not less than 170.
H. Edge/Joint Detail: Square, kerfed.

I. Thickness: 1 inch

J. Modular Size: 24 by 24 inches (305 by 305 mm)

K. Antimicrobial Treatment: Manufacturer's standard broad spectrum, 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 D3273, ASTM D3274, or ASTM G21 and evaluated according to ASTM D3274 or ASTM G21.

2.4 METAL SUSPENSION SYSTEM

A. Metal Suspension-System Standard: Armstrong XL, 15/16” Exposed Tee System, White Aluminum

1. High-Humidity Finish: provide coating tested and classified for "severe environment performance" according to ASTM C635/C635M.

2.5 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E488/E488M or ASTM E1512 as applicable, conducted by a qualified testing and inspecting agency.

   a. Type: Postinstalled bonded anchors.
   b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B633, Class SC 1 (mild) service condition.
   c. Corrosion Protection: Stainless-steel components complying with ASTM F593 and ASTM F594, Group 1 Alloy 304 or 316.

2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E1190, conducted by a qualified testing and inspecting agency.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:
2. Stainless-Steel Wire: ASTM A580/A580M, Type 304, nonmagnetic.
3. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.135-inch- (3.5-mm-) diameter wire.

C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized-steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.

F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate lateral forces.

H. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical tiles in-place during a seismic event.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements.

1. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils (0.04 mm). Comply with ASTM C635/C635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Examine acoustical tiles before installation. Reject acoustical tiles that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Testing Substrates: Before adhesively bonding tiles to wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer’s recommended limits.

B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

C. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

A. Install suspended acoustical tile ceilings according to ASTM C636/C636M, seismic design requirements, and manufacturer’s written instructions.

1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

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 to structure 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. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.

8. Do not attach hangers to steel deck tabs.

9. Do not attach hangers to steel roof deck. Attach hangers to structural members.

10. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.

11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical tiles.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends. Miter corners accurately and connect securely.

3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Arrange directionally patterned acoustical tiles as follows:

1. As indicated on reflected ceiling plans.

2. Install tiles with pattern running in one direction parallel to long axis of space.

3. Install tiles in a basket-weave pattern.

G. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension-system flanges into kerfed edges of tiles so tile-to-tile joints are interlocked.

1. Fit adjoining tiles to form flush, tight joints. Scribe and cut tiles for accurate fit at borders and around penetrations through ceiling.

2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tiles and moldings, spaced 12 inches (305 mm) o.c.

3. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.
3.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m), non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m), non-cumulative.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
   1. Periodic inspection during the installation of suspended ceiling grids according to ASCE/SEI 7.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Perform the following tests and inspections of completed installations of acoustical tile ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion, but no tiles have been installed. Do not proceed with installations of acoustical tile ceiling hangers for the next area until test results for previously completed installations of acoustical tile ceiling hangers show compliance with requirements.
   1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf (1957 N) of tension.
   2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

D. Acoustical tile ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
B. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095123
SECTION 099123
INTERIOR PAINTING

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section includes surface preparation and the application of paint systems on interior substrates.

1.3 DEFINITIONS
A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.
B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.
F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.
G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches (200 mm) square.
   2. Apply coats on Samples in steps to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
      a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
      b. Other Items: Architect will designate items or areas required.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS
A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Products: Subject to compliance with requirements, provide product listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL
A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
B. Material Compatibility:
   1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
C. Colors: As indicated in the finish schedule.
2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.

2. Testing agency will perform tests for compliance with product requirements.

3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Wood: 15 percent.
2. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Gypsum Board Substrates:

1. Latex over Latex Sealer System MPI INT 9.2A:
   a. Prime Coat: Primer sealer, latex, interior, MPI #50.
   b. Prime Coat: Latex, interior, matching topcoat.
   d. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.

B. Wood / Metal Substrates: Wood Windows and Metal Doors.

1. Latex over Latex Primer System MPI INT 6.3T:
   a. Prime Coat: Primer, latex, for interior wood, MPI #39.
   c. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.
END OF SECTION 099123
SECTION 102113.19
HDPE TOILET COMPARTMENTS

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. HDPE toilet compartments configured as toilet enclosures.

B. Related Requirements:
   1. Section 061053 "Miscellaneous Rough Carpentry" for blocking.

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 toilet compartments.

B. Shop Drawings: For toilet compartments.
   1. Include plans, elevations, sections, and attachment details.
   2. Show locations of cutouts for compartment-mounted toilet accessories.
   3. Show locations of reinforcements for compartment-mounted grab bars and locations of blocking for surface-mounted toilet accessories.
   4. Show locations of centerlines of toilet fixtures.
   5. Show locations of floor drains.

C. Samples for Initial Selection: For each type of toilet compartment material indicated.
   1. Include Samples of hardware and accessories involving material and color selection.

D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch- (152-mm-) square Samples of same thickness and material indicated for Work.

2. Each type of hardware and accessory.

E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments 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. Door Hinges: Two hinge(s) with associated fasteners.
2. Latch and Keeper: One latch and keeper with associated fasteners.
3. Door Bumper: One door bumper(s) with associated fasteners.
4. Door Pull: One door pull with associated fasteners.
5. Fasteners: 10 fasteners of each size and type.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.
2.2 HDPE TOILET COMPARTMENTS MANUFACTURERS

A. Acceptable Manufacturer: Scranton Products, which is located at: 801 E. Corey St.; Scranton, PA 18507; Toll Free Tel: 800-445-5148; Email: request info (info@scrantonproducts.com); Web: www.scrantonproducts.com.

B. Plastic Panels: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent, and graffiti-resistant textured surface;
   1. Fire Rating: Not required.
   2. Zinc Aluminum Magnesium and Copper Alloy (Zamac): ASTM B 86.

C. SOLID PLASTIC TOILET COMPARTMENTS
   2. Style: Floor mounted overhead-braced toilet compartments.
      a. Doors, panels, and pilasters shall be 1 inch (25 mm) thick with all edges rounded to a radius. Doors and dividing panels shall be mounted based on height of specified system.
   3. Panel Color: Linen
   4. Pilaster shoes shall be 3 inches (76 mm) high stainless steel (type 304, 20 gauge) secured to the pilaster with a stainless steel tamper resistant Torx head sex bolt.
   5. Pilaster shoes shall be 3 inches (76 mm) high one-piece molded HDPE secured to the pilaster with a stainless steel tamper resistant Torx head sex bolt.
   6. Headrail shall be made of heavy-duty extruded aluminum (6463-T5 alloy) with anti-grip design. The headrail shall have a clear anodized finish and shall be fastened to the headrail bracket by a stainless steel tamper resistant Torx head sex bolt, and fastened at the top of the pilaster with stainless steel tamper resistant Torx head screws.
   7. Headrail brackets shall be 20 gauge stainless steel with a satin finish and secured to the wall with a stainless steel tamper resistant Torx head screws.
   8. Wall Brackets:
      a. Stainless Steel Brackets: Wall brackets shall be made of stainless steel type 304.
      b. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.
   1. Hinges: Manufacturer's minimum 0.062-inch- (1.59-mm-) thick, stainless steel paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door. Mount with through-bolts.
2. Latch and Keeper: Manufacturer's heavy-duty, surface-mounted, cast stainless steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.

3. Coat Hook & Curtain: Owner will provide.


5. Door Pull: Manufacturer's heavy-duty cast stainless steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 SOLID PLASTIC PRIVACY SCREENS

A. Provide plastic privacy screens in urinal and entry toilet room applications as indicated or scheduled.

B. Panels, and pilasters, if required, shall be 1 inch (25 mm) thick with all edges rounded to a radius. Screens shall be mounted at 14 inches (356 mm) above the finished floor. Color as selected by Architect from manufacturer's full line of current colors.

C. Type: Wall mounted screen.

D. Wall brackets shall be 1-1/2 inches (38 mm) stirrup type made of heavy-duty aluminum (6463-T5 alloy). Stirrup brackets shall be fastened to panel/pilaster with stainless steel tamper resistant Torx head sex bolts.

2.5 MATERIALS

A. Aluminum Castings: ASTM B26/B26M.

B. Aluminum Extrusions: ASTM B221 (ASTM B221M).

C. Brass Castings: ASTM B584.

D. Brass Extrusions: ASTM B455.
E. Steel Sheet: Commercial steel sheet for exposed applications; mill phosphatized and selected for smoothness.

1. Electrolytically Zinc Coated: ASTM A879/A879M, 01Z (03G).

F. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

G. Stainless Steel Castings: ASTM A743/A743M.

2.6 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories, and solid blocking within panel where required for attachment of toilet accessories.

B. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

C. Floor-and-Ceiling-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.

D. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Coordinate layout and installation of supports, inserts, and anchors built into other units of work for toilet compartment anchorage.
3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position indicated with manufacturer's recommended anchoring devices.

1. Maximum Clearances:
   a. Pilasters and Panels: 1/2 inch (13 mm).
   b. Panels and Walls: 1 inch (25 mm).

2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.
   a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
   b. Align brackets at pilasters with brackets at walls.

3. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
   a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
   b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches (51 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.

D. Ceiling-Hung Units: Secure pilasters to supporting structure and level, plumb, and tighten. Hang doors and adjust so bottoms of doors are level with bottoms of pilasters when doors are in closed position.

E. Floor-and-Ceiling-Anchored Units: Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.

F. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.
3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113.19
SECTION 10 2119
SOLID PLASTIC SHOWER AND DRESSING COMPARTMENTS

PART 1  GENERAL

1.1  SUMMARY

A.  Section Includes:
   1.  Solid plastic shower and dressing compartments.

B.  Related Sections:
   1.  Division 01: Administrative, procedural, and temporary work requirements.

1.2  REFERENCES

A.  ASTM International (ASTM):


1.3  SUBMITTALS

A.  Submittals for Review:
   1.  Shop Drawings: Include dimensioned layout, elevations, trim, closures, and accessories.
   2.  Product Data: Manufacturer's descriptive data for panels, hardware, and accessories.
   3.  Samples: 2 x 3 inch samples [showing available colors.] [in each color.]

1.4  QUALITY ASSURANCE

A.  Manufacturer Qualifications: Minimum 5 years experience in manufacture of solid plastic shower and dressing compartments with products in satisfactory use under similar service conditions.

B.  Installer Qualifications: Minimum 5 years experience in work of this Section.

1.5  WARRANTIES

A.  Provide manufacturer's 25 year warranty against breakage, corrosion, and delamination under normal conditions.

PART 2  PRODUCTS

2.1  MANUFACTURERS

A.  Contract Documents are based on products by Scranton Products. ([www.scrantonproducts.com](http://www.scrantonproducts.com))

B.  Substitutions: [Under provisions of Division 01.] [Not permitted.]

2.2  MATERIALS

A.  Doors, Panels and Pilasters:
   1.  High density polyethylene (HDPE), fabricated from polymer resins compounded under high pressure, forming single thickness panel.
2. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.
3. 1 inch thick with radiused edges.
5. Color: Linen

B. Aluminum Extrusions: ASTM B221, 6463-T5 alloy and temper.

C. Shower Curtains & Hooks will be provided by owners.

2.3 COMPONENTS

A. Panels: 76 inches high, mounted to pilasters with continuous brackets and to panels with continuous extruded aluminum brackets or continuous extruded aluminum shower corner brackets.

B. Pilasters: 82 inches high, fastened to panels with continuous brackets.

C. Headrail: Heavy-duty extruded aluminum, anti-grip design, clear anodized finish, fastened to headrail brackets and top of pilaster using stainless steel tamper-resistant Torx head screws.

D. Headrail Brackets: 20 gage stainless steel, secured using stainless steel tamper-resistant Torx head screws.

E. Brackets: 76 inches long, extruded aluminum, clear anodized finish, attached using stainless steel tamper-resistant Torx head screws.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install compartments in accordance with manufacturer’s instructions and approved Shop Drawings.

B. Install rigid, straight, plumb, and level.

C. Not Acceptable: Evidence of cutting, drilling, or patching.

END OF SECTION 102119
SECTION 123661.16
SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section Includes:
      1. Solid surface material countertops.
      2. Solid surface material apron fronts.

1.3 ACTION SUBMITTALS
   A. Product Data: For countertop materials.
   B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash
      profiles, methods of joining, and cutouts for plumbing fixtures.
      1. Show locations and details of joints.
      2. Show direction of directional pattern, if any.
   C. Samples for Initial Selection: For each type of material exposed to view.
   D. Samples for Verification: For the following products:
      1. Countertop material, 6 inches (150 mm) square.
      2. One full-size solid surface material countertop, with front edge, 8 by 10 inches
         (200 by 250 mm), of construction and in configuration specified.

1.4 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For fabricator.
1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.
   1. Build mockup of typical countertop as shown on Drawings.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.

   1. Manufacturer: Silestone – Silestone
   2. Type: Provide Standard type unless Special Purpose type is indicated.
   3. Colors and Patterns: As indicated on drawings.

B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: Premium.

B. Configuration:

1. Front: Straight, slightly eased at top

C. Countertops: 3/4-inch- (19-mm-) thick, solid surface material with front edge built up with same material.

D. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose backsplashes for field assembly.
2. Install integral sink bowls in countertops in the shop.

E. Joints: Fabricate countertops without joints.

F. Joints: Fabricate countertops in sections for joining in field.

1. Joint Locations: Not within 18 inches (450 mm) of a sink or cooktop and not where a countertop section less than 36 inches (900 mm) long would result, unless unavoidable.
2. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints. Make width of cuts slightly more than thickness of splines to provide snug fit. Provide at least three splines in each joint.

G. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
   
   a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch (5 mm) into fixture opening.
   
   b. Provide vertical edges, rounded to 3/8-inch (10-mm) radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch (5 mm) into fixture opening.
   
   c. Provide 3/4-inch (20-mm) full bullnose edges projecting 3/8 inch (10 mm) into fixture opening.

3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.


2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m), 1/4 inch (6 mm) maximum. Do not exceed 1/64-inch (0.4-mm) difference between planes of adjacent units.

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill 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.

C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. 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.

E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

1. Seal edges of cutouts in particleboard subtops by saturating with varnish.

I. Apply sealant to gaps at walls.

END OF SECTION 123661.16
PART 1 - GENERAL

PART 2 - GENERAL

2.1 SUMMARY

A. Section Includes:
   1. Sleeves.
   2. Sleeve-seal systems.

2.2 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 3 - PRODUCTS

3.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral water stop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.


E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

F. Galvanized split sleeves ("snap" sleeves): 26 gauge minimum thickness; round tube.
3.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.
6. Or equal.

C. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel or Stainless steel
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, or Stainless steel of length required to secure pressure plates to sealing elements.

3.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, water stop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber water stop collar with center opening to match piping OD.

3.4 GROUT


B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 4 - EXECUTION

4.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
   1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
   1. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
   2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.
   1. Cut sleeves to length for mounting flush with both surfaces.
   2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
   3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Division 07 Section "Joint Sealants."

E. Fire-BARRIER Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "078400 Firestopping."

4.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

4.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:
   1. Exterior Concrete Walls above Grade:
a. Piping Smaller Than NPS 6 Cast-iron wall sleeves, Galvanized-steel wall sleeves or Galvanized-steel-pipe sleeves.
b. Piping NPS 6 and Larger: Cast-iron wall sleeves or Galvanized-steel wall sleeves/Galvanized-steel-pipe sleeves.

2. Exterior Concrete Walls below Grade:
   a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system or Galvanized-steel wall sleeves with sleeve-seal system.
      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
   b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system or Galvanized-steel wall sleeves with sleeve-seal system.
      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:
   a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system or Galvanized-steel wall sleeves with sleeve-seal system.
      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
   b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system or Galvanized-steel wall sleeves with sleeve-seal system or pour slab flush with penetrating pipe.
      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system or pour slab flush with penetrating pipe.

4. Concrete Slabs above Grade:
   a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves or PVC-pipe sleeves.
   b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves or PVC-pipe sleeves.

5. Interior Partitions:
   a. Piping Smaller Than NPS 6 Insert pipe size: or pour slab flush with penetrating pipe.

END OF SECTION 220517
SECTION 220518
ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section Includes:
      1. Escutcheons.
      2. Floor plates.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS
   A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
   B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
   C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.
   D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.
   E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.
2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting 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 type.
   b. Chrome-Plated Piping: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
   c. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
   d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
   e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
   f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
   g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
   h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass or split-casting brass type with rough-brass finish.
   i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with exposed-rivet hinge.
   j. Bare Piping in Equipment Rooms: One-piece, cast-brass or split-casting brass type with rough-brass finish.
   k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.

2. Escutcheons for Existing Piping:
   a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
   b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge.
   c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.

e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.

f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.

g. Bare Piping in Unfinished Service Spaces: Split-casting brass type with rough-brass finish.

h. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with exposed-rivet hinge.

i. Bare Piping in Equipment Rooms: Split-casting brass type with rough-brass finish.

j. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with concealed or hinge.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 220518
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Brass ball valves.
   2. Bronze angle valves.
   3. Bronze ball valves.
   4. Bronze swing check valves.
   5. Bronze gate valves.
   7. Bronze globe valves.

B. Related Sections:
   1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
   2. Division 22 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

1.2 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.3 QUALITY ASSURANCE

A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

B. NSF Compliance: NSF 61 for valve materials for potable-water service.

C. API Compliance: API 608 for ball valves.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

E. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

2.2 BRASS BALL VALVES

A. One-Piece, Reduced-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Kitz Corporation.
   b. Or equal.

2. Description:
   b. CWP Rating: 400 psig.
   c. Body Design: One piece.
   d. Body Material: Forged brass.
   e. Ends: Solder, Pressure seal, threaded.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Brass.
   i. Ball: Chrome-plated brass.
   j. Port: Reduced.

B. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. DynaQuip Controls.
d. Flow-Tek, Inc.; a subsidiary of Bray International, Inc.
e. Hammond Valve.
f. Jamesbury; a subsidiary of Metso Automation.
g. Jomar International, LTD.
h. Kitz Corporation.
i. Legend Valve.
j. Marwin Valve; a division of Richards Industries.
k. Milwaukee Valve Company.
l. Red-White Valve Corporation.
m. RuB Inc.
n. OR EQUAL.

2. Description:
   b. SWP Rating: 150 psig.
   c. CWP Rating: 600 psig.
   d. Body Design: Two piece.
   e. Body Material: Forged brass.
   f. Ends: Solder, Pressure seal, threaded.
   g. Ends: Threaded.
   h. Seats: PTFE or TFE.
   i. Stem: Brass.
   j. Ball: Chrome-plated brass.
   k. Port: Full.

C. Two-Piece, Regular-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Hammond Valve.
   b. Jamesbury; a subsidiary of Metso Automation.
   c. Legend Valve.
   d. Marwin Valve; a division of Richards Industries.
   e. Milwaukee Valve Company.
   f. OR equal.

2. Description:
   b. SWP Rating: 150 psig.
   c. CWP Rating: 600 psig.
   d. Body Design: Two piece.
   e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Brass.
i. Ball: Chrome-plated brass.
j. Port: Regular.

2.3 BRONZE ANGLE VALVES

A. Class 125, Bronze Angle Valves with Bronze Disc:
   1. Manufacturers: Subject to compliance with requirements. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Crane.
      b. Milwaukee Valve Company
      c. or equal
   2. Description:
      a. Standard: MSS SP-80, Type 1.
      b. CWP Rating: 300 psig.
      d. Ends: Solder, Pressure seal, threaded.
      e. Stem and Disc: Bronze.
      f. Packing: Asbestos free.

2.4 BRONZE BALL VALVES

A. One-Piece, Reduced-Port, Bronze Ball Valves with Bronze Trim:
   1. Manufacturers: Subject to compliance with requirements. Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. American Valve, Inc.
      b. Conbraco Industries, Inc.; Apollo Valves.
      c. Or equal.
   2. Description:
      b. CWP Rating: 400 psig.
      c. Body Design: One piece.
      d. Body Material: Bronze.
      e. Ends: Solder, Pressure seal, threaded.
      f. Ends: Threaded.
      g. Seats: PTFE or TFE.
h. Stem: Bronze.
  i. Ball: Chrome-plated brass.
  j. Port: Reduced.

B. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. American Valve, Inc.
   b. Conbraco Industries, Inc.; Apollo Valves.
   c. Crane Co.; Crane Valve Group; Crane Valves.
   d. Hammond Valve.
   e. Lance Valves; a division of Advanced Thermal Systems, Inc.
   f. Legend Valve.
   g. Milwaukee Valve Company.
   h. Red-White Valve Corporation.
   i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   j. Or equal.

2. Description:
   b. SWP Rating: 150 psig.
   c. CWP Rating: 600 psig.
   d. Body Design: Two piece.
   e. Body Material: Bronze.
   f. Ends: Solder, Pressure seal, threaded.
   g. Ends: Threaded.
   h. Seats: PTFE or TFE.
   i. Stem: Bronze.
   j. Ball: Chrome-plated brass.
   k. Port: Full.

C. Two-Piece, Regular-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. American Valve, Inc.
   b. Conbraco Industries, Inc.; Apollo Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Division.
   e. DynaQuip Controls.
   f. Hammond Valve.
   g. Lance Valves; a division of Advanced Thermal Systems, Inc.
   h. Milwaukee Valve Company.
   i. Or equal.
2. Description:
   b. SWP Rating: 150 psig.
   c. CWP Rating: 600 psig.
   d. Body Design: Two piece.
   e. Body Material: Bronze.
   f. Ends: Solder, Pressure seal, threaded.
   g. Ends: Threaded.
   h. Seats: PTFE or TFE.
   i. Stem: Bronze.
   j. Ball: Chrome-plated brass.
   k. Port: Regular.

2.5 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Valve, Inc.
      b. Crane Co.; Crane Valve Group; Crane Valves.
      c. Crane Co.; Crane Valve Group; Jenkins Valves.
      d. Crane Co.; Crane Valve Group; Stockham Division.
      e. Hammond Valve.
      f. Kitz Corporation.
      g. Milwaukee Valve Company.
      h. Powell Valves.
      i. Red-White Valve Corporation.
      j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
      k. Zy-Tech Global Industries, Inc.

2. Description:
   a. Standard: MSS SP-80, Type 3.
   b. CWP Rating: 200 psig.
   c. Body Design: Horizontal flow.
   e. Ends: Solder, Pressure seal, threaded.
   f. Disc: Bronze.

B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Milwaukee Valve Company.
g. Red-White Valve Corporation.
h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 4.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
e. Ends: Solder, Pressure seal, threaded.
f. Disc: PTFE or TFE.
g. Or equal.

2.6 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. Powell Valves.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
k. Zy-Tech Global Industries, Inc.
l. Or equal.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig.
d. Ends: Solder, Pressure seal, threaded.
e. 

f. Stem: Bronze.
g. Disc: Solid wedge; bronze.

h. Packing: Asbestos free.

i. Handwheel: Malleable iron, bronze, or aluminum.

B. Class 125, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. American Valve, Inc.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Division.
   e. Hammond Valve.
   f. Kitz Corporation.
   g. Milwaukee Valve Company.
   h. Powell Valves.
   i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   j. Zy-Tech Global Industries, Inc.
   k. Or equal.

2. Description:

   a. Standard: MSS SP-80, Type 2.
   b. CWP Rating: 200 psig.
   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.

2.7 IRON GATE VALVES

A. Class 125, NRS, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Division.
   d. Flo Fab Inc.
   e. Hammond Valve.
   f. Kitz Corporation.
   g. Legend Valve.
   h. Milwaukee Valve Company.
   i. Powell Valves.
2. Description:
   a. Standard: MSS SP-70, Type I.
   b. CWP Rating: 200 psig.
   c. Body Material: ASTM A 126, gray iron with bolted bonnet.
   d. Ends: Flanged.
   e. Trim: Bronze.
   f. Disc: Solid wedge.
   g. Packing and Gasket: Asbestos free.

B. Class 125, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Division.
   d. Flo Fab Inc.
   e. Hammond Valve.
   f. Kitz Corporation.
   g. Legend Valve.
   h. Milwaukee Valve Company.
   i. Powell Valves.
   j. Red-White Valve Corporation.
   k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   l. Zy-Tech Global Industries, Inc.
   m. Or equal.

2. Description:
   a. Standard: MSS SP-70, Type I.
   b. CWP Rating: 200 psig.
   c. Body Material: ASTM A 126, gray iron with bolted bonnet.
   d. Ends: Flanged.
   e. Trim: Bronze.
   f. Disc: Solid wedge.
   g. Packing and Gasket: Asbestos free.

2.8 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Stockham Division.
   c. Hammond Valve.
   d. Kitz Corporation.
   e. Milwaukee Valve Company.
   f. Powell Valves.
   g. Red-White Valve Corporation.
   h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   i. Zy-Tech Global Industries, Inc.
   j. Or equal.

2. Description:
   a. Standard: MSS SP-80, Type 1.
   b. CWP Rating: 200 psig.
   d. Ends: Solder, Pressure seal, threaded.
   e. 
   f. Stem and Disc: Bronze.
   g. Packing: Asbestos free.
   h. Handwheel: Malleable iron, bronze, or aluminum.

B. Class 125, Bronze Globe Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Stockham Division.
   c. Red-White Valve Corporation.

2. Description:
   a. Standard: MSS SP-80, Type 2.
   b. CWP Rating: 200 psig.
   d. Ends: Threaded or solder joint.
   e. Stem: Bronze.
   f. Disc: PTFE or TFE.
   g. Packing: Asbestos free.
   h. Handwheel: Malleable iron, bronze, or aluminum.
PART 3 - EXECUTION

3.1 VALVE INSTALLATION
   A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
   B. Locate valves for easy access and provide separate support where necessary.
   C. Install valves in horizontal piping with stem at or above center of pipe or as allowed by manufacturer recommendations (ie. vertical piping).
   D. Install valves in position to allow full stem movement.
   E. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

3.2 ADJUSTING
   A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS
   A. If valve applications are not indicated, use the following:
      1. Shutoff Service: Ball, butterfly, or gate valves.
      2. Throttling Service: Globe or ball or butterfly valves.
      3. Pump-Discharge Check Valves:
         a. NPS 2 and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
         b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight or with spring.
   B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
   C. Select valves, except wafer types, 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 & LAB VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:
   1. Bronze and Brass Valves: May be provided with solder-joint ends or pressure seal instead of threaded ends.
   2. Bronze Angle Valves: Class 125, bronze disc.
   3. Ball Valves: One piece, full port, brass or bronze with brass trim.
   4. Bronze Swing Check Valves: Class 125, bronze disc.
   5. Bronze Gate Valves: Class 125, NRS.

END OF SECTION 220523
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Pipe positioning systems.
8. Equipment supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Fiberglass strut systems.
4. Pipe stands.
5. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

B. Stainless-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

C. Copper Pipe Hangers:
   1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. G-Strut.
      b. Unistrut; Part of Atkore International.
   2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
   4. Channels: Continuous slotted steel channel with inturned lips.
   5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.

B. Non-MFMA Manufacturer Metal Framing Systems:
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
   
   a. [Anvil International](#).
   
   b. [Empire Industries, Inc.](#).
   
   c. [ERICO International Corporation](#).

2. **Description:** Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.

3. **Standard:** Comply with MFMA-4.

4. **Channels:** Continuous slotted steel channel with inturned lips.

5. **Channel Nuts:** Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.

6. **Hanger Rods:** Continuous-thread rod, nuts, and washer made of stainless steel.

7. **Coating:** Zinc.

### 2.4 THERMAL-HANGER SHIELD INSERTS

A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:

   1. [ERICO International Corporation](#).
   
   2. [Piping Technology & Products, Inc.](#).
   
   3. [Rilco Manufacturing Co., Inc.](#).

B. **Insulation-Insert Material for Cold Piping:** ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. **Insulation-Insert Material for Hot Piping:** ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

D. **For Trapeze or Clamped Systems:** Insert and shield shall cover entire circumference of pipe.

E. **For Clevis or Band Hangers:** Insert and shield shall cover lower 180 degrees of pipe.

F. **Insert Length:** Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.
2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:

1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
2. Bases: One or more; plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.
2.7 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.9 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
   2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
   1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
   2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.

D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
E. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled fiberglass struts.

F. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

G. 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.

H. Pipe Stand Installation:
   1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
   2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.

I. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

J. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.


L. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

M. Install lateral bracing with pipe hangers and supports to prevent swaying.

N. 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.

O. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

P. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
Q. Insulated Piping:

1. Attach clamps and spacers to piping.
   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
   e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.

6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.
3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and attachments for general service applications.

F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.

17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.

18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.

19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.

21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
   a. Light (MSS Type 31): 750 lb.
   b. Medium (MSS Type 32): 1500 lb.
   c. Heavy (MSS Type 33): 3000 lb.
13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
   2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
   3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
   2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
   3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
   4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
   a. Horizontal (MSS Type 54): Mounted horizontally.
   b. Vertical (MSS Type 55): Mounted vertically.
   c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

R. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529
SECTION 220553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Stencils.
5. Valve tags.
6. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
   
a. **Brady Corporation.**
b. **Brimar Industries, Inc.**
c. **Champion America.**
d. **Emedco.**
e. **Kolbi Pipe Marker Co.**

2. **Material and Thickness:** Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.

3. **Letter Color:** Black.

4. **Background Color:** Black.

5. **Minimum Label Size:** Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

6. **Minimum Letter Size:** 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

7. **Fasteners:** Stainless-steel self-tapping screws.

8. **Adhesive:** Contact-type permanent adhesive, compatible with label and with substrate.

**B. Plastic Labels for Equipment:**

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
   
a. **Brady Corporation.**
b. **Brimar Industries, Inc.**
c. **Champion America.**
d. **Emedco.**
e. **Kolbi Pipe Marker Co.**

2. **Material and Thickness:** Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

3. **Letter Color:** Black.

4. **Background Color:** Black.

5. **Maximum Temperature:** Able to withstand temperatures up to 160 deg F.

6. **Minimum Label Size:** Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

7. **Minimum Letter Size:** 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

8. **Fasteners:** Stainless-steel self-tapping screws.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Champion America.
4. emedco.
5. LEM Products Inc.
7. Seton Identification Products.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

C. Letter Color: Black.

D. Background Color: Black.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.


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

2.3 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation.
5. Craftmark Pipe Markers.
6. emedco.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

   1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
   2. Lettering Size: Size letters according to ASME A13.1 for piping.

2.4 STENCILS

A. Stencils for Piping:

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Brimar Industries, Inc.
      b. Carlton Industries, LP.
      c. Champion America.
      d. Craftmark Pipe Markers.
      e. Kolbi Pipe Marker Co.
2. Lettering Size: Size letters according to ASME A13.1 for piping.
4. Stencil Paint: Exterior, gloss, alkyd enamel in colors complying with recommendations in ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.
5. Identification Paint: Exterior, alkyd enamel in colors according to ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.

2.5 VALVE TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
   2. Brady Corporation.
   3. Champion America.
   4. emedco.
   5. Kolbi Pipe Marker Co.

B. 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 chain.

C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
   1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Brady Corporation.
   2. Brimar Industries, Inc.
   3. Carlton Industries, LP.

B. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.
   1. Size: 3 by 5-1/4 inches minimum.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
B. Coordinate installation of identifying devices with locations of access panels and doors.
C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

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

3.4 PIPE LABEL INSTALLATION

A. Piping Color Coding: Painting of piping is specified in Section 099123 "Interior Painting."
B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.
   1. Identification Paint: Use for contrasting background.
C. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs 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.

D. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

E. Pipe Label Color Schedule:

1. Low-Pressure Compressed Air Piping:
   a. Background: Safety blue.

2. High-Pressure Compressed Air Piping:
   a. Background: Safety blue.

3. Domestic Water Piping
   a. Background: Safety green.

4. Sanitary Waste and Storm Drainage Piping:
   a. Background Color: Safety white.
   b. Letter Color: Black.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:
c. Low-Pressure Compressed Air: 1-1/2 inches, round.
d. High-Pressure Compressed Air: 1-1/2 inches, round.

2. Valve-Tag Colors:
   b. Hot Water: Natural.
   c. Low-Pressure Compressed Air: Natural.
   d. High-Pressure Compressed Air: Natural.

3. Letter Colors:
   c. Low-Pressure Compressed Air: White.
   d. High-Pressure Compressed Air: White.

3.6 WARNING-TAG INSTALLATION

   A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553
SECTION 220719

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Domestic recirculating hot-water piping.
4. Domestic chilled-water piping for drinking fountains.
5. Sanitary waste piping exposed to freezing conditions.
6. Storm-water piping exposed to freezing conditions.
7. Roof drains and rainwater leaders.
8. Supplies and drains for handicap-accessible lavatories and sinks.

B. Related Sections:

1. Section 220716 "Plumbing Equipment Insulation."

1.3 ACTION SUBMITTALS

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

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties, equipment connections, and access panels.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:

1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2.
4. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products 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. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.

1. Piping Mockups:
   a. One 10-foot section of NPS 2 straight pipe.
b. One each of a 90-degree threaded, welded, and flanged elbow.
c. One each of a threaded, welded, and flanged tee fitting.
d. One NPS 2 or smaller valve, and one NPS 2-1/2 or larger valve.
e. Four support hangers including hanger shield and insert.
f. One threaded strainer and one flanged strainer with removable portion of insulation.
g. One threaded reducer and one welded reducer.
h. One pressure temperature tap.
i. One mechanical coupling.

2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Obtain Architect's approval of mockups before starting insulation application.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed.

D. Comply with the following applicable standards and other requirements specified for miscellaneous components:


1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

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

C. Coordinate installation and testing of heat tracing.
1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS


B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Block Insulation: ASTM C 552, Type I.
2. Special-Shaped Insulation: ASTM C 552, Type III.
3. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
4. Preformed Pipe Insulation with Factory-Applied [ASJ] [ASJ-SSL]: Comply with ASTM C 552, Type II, Class 2.
5. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

H. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
I. Mineral-Fiber, Preformed Pipe Insulation:

1. 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. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

J. Phenolic:

1. Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type III, Grade 1.
2. Block insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type II, Grade 1.
3. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

K. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials.

2.2 INSULATING CEMENTS


B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.


2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

E. Phenolic Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.

G. PVC Jacket Adhesive: Compatible with PVC jacket.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
   1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
   2. Service Temperature Range: Minus 20 to plus 180 deg F.
   3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.
   1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
   2. Service Temperature Range: 0 to 180 deg F.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.
   1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
   2. Service Temperature Range: Minus 50 to plus 220 deg F.
   3. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
   1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
   2. Service Temperature Range: Minus 20 to plus 180 deg F.
   3. Solids Content: 60 percent by volume and 66 percent by weight.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.
1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
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.

2.6 SEALANTS

A. Joint Sealants for Cellular-Glass and Phenolic Products:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Permanently flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 100 to plus 300 deg F.

B. FSK and Metal Jacket Flashing Sealants:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Fire- and water-resistant, flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 40 to plus 250 deg F.

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Fire- and water-resistant, flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 40 to plus 250 deg F.

2.7 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.

2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.
B. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.

2.9 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd..

2.10 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. Adhesive: As recommended by jacket material manufacturer.
3. 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. Metal Jacket:

   a. Factory cut and rolled to size.
   b. Finish and thickness are indicated in field-applied jacket schedules.
   d. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
   e. Factory-Fabricated Fitting Covers:
      1) Same material, finish, and thickness as jacket.
      2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
      3) Tee covers.
      4) Flange and union covers.
      5) End caps.
      6) Beveled collars.
      7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2. Stainless-Steel Jacket: ASTM A 167 or ASTM A 240/A 240M.
   a. Factory cut and rolled to size.
   b. Material, finish, and thickness are indicated in field-applied jacket schedules.
   d. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
   e. Factory-Fabricated Fitting Covers:
      1) Same material, finish, and thickness as jacket.
      2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
      3) Tee covers.
      4) Flange and union covers.
      5) End caps.
      6) Beveled collars.
      7) Valve covers.
      8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

D. 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. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2.11 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
   1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
   2. Width: 3 inches.
   3. Thickness: 11.5 mils.
   5. Elongation: 2 percent.
   6. Tensile Strength: 40 lbf/inch in width.
   7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Width: 3 inches.
3. Thickness: 6.5 mils.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Width: 2 inches.
3. Thickness: 6 mils.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Width: 2 inches.
3. Thickness: 3.7 mils.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.12 SECUREMENTS

A. Bands:
1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing seal or closed seal.
2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: 0.080-inch nickel-copper alloy.

2.13 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers,:
1. 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. 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 2 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.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
   4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, 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 CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer’s recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer’s written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:
   1. Install pipe insulation to outer diameter of pipe flange.
   2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
   4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:
   1. Install mitered sections of pipe insulation.
   2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:
   1. Install preformed valve covers manufactured of same material as pipe insulation when available.
   2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   3. Install insulation to flanges as specified for flange insulation application.
   4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 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.

3.9 INSTALLATION OF PHENOLIC INSULATION

A. General Installation Requirements:

1. Secure single-layer insulation with stainless-steel bands at 12-inch intervals and tighten bands without deforming insulation materials.
2. Install 2-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with 0.062-inch wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-inch intervals.

B. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

C. Insulation Installation on Pipe Flanges:
   1. Install preformed pipe insulation to outer diameter of pipe flange.
   2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of same material and thickness as pipe insulation.

D. Insulation Installation on Pipe Fittings and Elbows:
   1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.

E. Insulation Installation on Valves and Pipe Specialties:
   1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.
   2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   3. Install insulation to flanges as specified for flange insulation application.

3.10 INSTALLATION OF POLYOLEFIN INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
   1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:
   1. Install pipe insulation to outer diameter of pipe flange.
   2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.
   4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
C. Insulation Installation on Pipe Fittings and Elbows:
   1. Install mitered sections of polyolefin pipe insulation.
   2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:
   1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
   2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   3. Install insulation to flanges as specified for flange insulation application.
   4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.11 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.
3.12 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

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

3.14 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.

3.15 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:
   1. NPS 1 and Smaller: Insulation shall be one of the following:
      b. Flexible Elastomeric: 1/2 inch thick.
      c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
      d. Phenolic: 1 inch thick.
      e. Polyolefin: 1/2 inch thick.

   2. NPS 1-1/4 and Larger: Insulation shall be one of the following:
      b. Flexible Elastomeric: 1 inch thick.
      c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
      d. Phenolic: 1 inch thick.
      e. Polyolefin: 1 inch thick.

B. Domestic Hot and Recirculated Hot Water:
   1. NPS 1-1/4 and Smaller: Insulation shall be one of the following:
      b. Flexible Elastomeric: 1 inch thick.
      c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
      d. Phenolic: 1 inch thick.
      e. Polyolefin: 1 inch thick.

   2. NPS 1-1/2 and Larger: Insulation shall be one of the following:
      b. Flexible Elastomeric: 1 inch thick.
      c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
      d. Phenolic: 1 inch thick.
      e. Polyolefin: 1 inch thick.

C. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:
   1. All Pipe Sizes: Insulation shall be one of the following:
      a. Flexible Elastomeric: 1/2 inch thick.
      b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
c. Polyolefin: 1/2 inch thick.

### 3.16 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

   1. None.

D. Piping, Exposed:

   1. PVC: 20 mils thick.
   2. Aluminum, Smooth: 0.016 inch thick.
   3. Painted Aluminum, Smooth: 0.016 inch thick.
   4. Stainless Steel, Type 304 or Type 316: 0.010 inch thick.

### 3.17 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

   1. None.

D. Piping, Exposed:

   1. PVC: 20 mils thick.
   2. Aluminum, Smooth: 0.016 inch thick.
   3. Stainless Steel, Type 304 or Type 316: 0.010 inch thick.

END OF SECTION 220719
SECTION 221116
DOMESTIC AND LABORATORY WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.2 SUMMARY

A. Provide materials and installation for complete first class plumbing systems, within and to five feet beyond building perimeter unless noted otherwise on Contract Drawings; Sanitary Waste and Vent Piping, Storm Drain Piping, Water Piping, Water Valves, Testing and other normal parts that make the systems operable, code compliant and acceptable to the authorities having jurisdiction.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
   1. International Plumbing Code (IPC) Supplemental.

1.4 QUALITY ASSURANCE

A. Manufacturer’s name and pressure rating shall be permanently marked on valve body.

B. Manufacturer Qualifications: Company shall have minimum three years documented experience specializing in manufacturing the products specified in this section.

C. Installer Qualifications:
   1. Company shall have minimum three years documented experience specializing in performing the work of this section.
2. Installation of plumbing systems shall be performed by individuals licensed by the State Board of Plumbing Examiners as a Journeyman or Master Plumber. Installation may be performed by Apprentice Plumbers provided they are registered with the State Board of Plumbing examiners and under direct supervision of a licensed plumber. All installation shall be supervised by a licensed Master Plumber.

1.5 SUBMITTALS

A. Product Data:
   1. Code and Standards compliance, manufacturer's data for pipe, fittings, valves and all other products included within this specification section.
   2. Manufacturer's installation instructions.

B. Record Documents:
   1. Record actual locations of valves, etc. and prepare valve charts.
   2. Test reports and inspection certification for all systems listed herein.
   3. Provide a certificate of completion detailing the water system chlorination procedure and all laboratory test results.
   4. Submit proposed location of access panels which vary from quantities or locations indicated on Contract Drawings.
   5. Provide full written description of manufacturer’s warranty.

C. Operation and Maintenance Data:
   1. Include components of system, servicing requirements, Record Drawings, inspection data, installation instructions, exploded assembly views, replacement part numbers and availability, location and contact numbers of service depot.

1.6 DELIVERY, STORAGE and HANDLING

A. All materials shall be new, undamaged, and free of rust.

B. Accept valves on Site in shipping containers and maintain in place until installation.

C. Provide temporary protective coating and end plugs on valves not packaged within containers. Maintain in place until installation.

D. Provide temporary end caps and closures on pipe and fittings. Maintain in place until installation.

E. Protect installed piping, valves and associated materials during progression of the construction period to avoid clogging with dirt, and debris and to prevent damage, rust, etc. Remove dirt and debris and repair materials as work progresses and isolate parts of completed system from uncompleted parts.

F. Protect all materials that are to be installed within this project from exposure to rain, freezing temperatures and direct sunlight. EXCEPTION: Materials manufactured for exterior locations.
1.7 EXTRA MATERIALS

A. Provide the Owner with one differential pressure meter kit for use with hot water return circuit balancing valves installed within this project. Kit shall include meter, hoses, connection accessories, circular slide rule, carrying case and valve manufacturer’s curve charts.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Provide materials as specified herein and indicated on Contract Drawings. All materials and work shall meet or exceed all applicable Federal and State requirements and conform to adopted codes and ordinances of authorities having jurisdiction.

C. Pressure ratings of pipe, fittings, couplings, valves, and all other appurtenances shall be suitable for the anticipated system pressures in which they are installed.

2.2 PIPING (Including Cold, Hot & Softened Water)

A. All materials within water distribution systems that may come in contact with the potable water delivered shall comply with the following standards;
   2. EPA Facilities Manual Volume II AE guidelines

B. All brass and bronze piping materials within water distribution systems that may come in contact with the potable water delivered shall have no more than 15% zinc content.

C. Solder for copper piping shall be lead-free Tin/Copper/Silver/Nickle(optional) solder conforming to ASTM B32, Wolverine Silvabrite 100 Lead-Free Solder or Harris Nick Lead-Free Solder. Use water soluble flux recommended by solder manufacturer and conforming to ASTM B813 and NSF 61, Wolverine Silvabrite 100 Water Soluable Flux or Bridgit Water Soluble Paste Flux.

D. Buried pressurized piping sizes 1” and smaller shall be type “K” soft copper. No joints shall be allowed below slab. Encase piping within ½” thick un-slit flexible tube type elastomeric thermal insulation up to 1” above slab at both ends. Insulation shall be AP/Armaflex or Rubatex Insul-Tube 180.

E. Unburied trap primer piping shall be same as specified for water except all elbows shall be long radius type.

F. Buried trap primer piping shall be type “K” soft copper. No joints shall be allowed below slab except at connection to drain. Encase piping within ½” thick un-slit flexible tube
type elastomeric thermal insulation up 1” above slab. Insulation shall be AP/Armaflex or Rubatex Insul-Tube 180.

G. Dielectric waterway fittings shall have zinc electroplated steel pipe body with high temperature stabilized polyolefin polymer liner; manufactured by Victaulic, Style 47 or PPP, Inc. Series 19000.

H. Dielectric unions shall be rated at 250 psi, ground-joint type with inert, non-corrosive thermoplastic sleeve. End connection materials shall be compatible with respective piping materials; manufactured by EPCO Sales, Inc. Provide models to suit applicable transitions.

I. Dielectric flanges shall be rated at 175 psi, have nylon bolt isolators and dielectric gasket. Materials shall be compatible with respective piping materials; manufactured by EPCO Sales, Inc. Provide models to suit applicable transitions.

J. Pipe joint compound shall be lead-free, non-toxic, non-hardening and compliant with ANSI/NSF 61 and Federal Specification TT-S-1732. Temperature service range of -15ºF to +400ºF, manufactured by Hercules “MegaLoc” or approved equal by Rectorseal, La-Co or Oatey.

K. Unions and Flanges
   1. Unions, flanges and gasket materials to have pressure rating of not less than 150 psig at 180º F.
   2. Copper 3” and smaller, Wrought copper union, Mueller Brass or equal.
   3. Copper 4” and larger, Cast red brass flanges, alloy 844, ASTM B584, Class 150, standard pattern, ANSI Standard B16.24 with neoprene gasket.

2.3 VALVES: (Including Cold, Hot & Softened Water)

A. All materials within water distribution systems that may come in contact with the potable water delivered shall comply with the following standards;
   2. EPA Facilities Manual Volume II AE guidelines

B. All brass and bronze valve materials within water distribution systems that may come in contact with the potable water delivered shall have no more than 15% zinc content.

C. Similar types of valves shall be the product of one manufacturer; i.e., all butterfly valves shall be of the same manufacturer, all ball valves shall be of the same manufacturer, etc. EXCEPTION: 2-1/2” & 3” ball valves may be by a different manufacturer than 2” and smaller ball valves.

D. Line Shut-Off Valves up to and including 2” shall be two-piece bronze body of ASTM B584 Alloy 844, ASTM B61, or ASTM B62, full port ball type rated at 600 WOG with threaded connections, blow-out proof stem, plastic coated lockable lever handle, Teflon packing, 316 stainless steel ball and stem.

E. Line Shut-Off Valves sizes 2-1/2” and 3” shall be full port ball type rated at 400 WOG with threaded connections, two-piece bronze body ASTM B584 with 316 stainless steel
ball and stem, plastic coated lockable lever handle, blow out proof stem and reinforced Teflon seats. Acceptable valves are Kitz Model 68PM, or approved equivalent model by Crane, Milwaukee or Apollo.

F. Line Shut-Off Valves 4” and larger where system operating pressure will not exceed 160 p.s.i.g. shall be 200 WOG threaded lug type ductile iron body butterfly valve with extended neck, lockable lever handle, 416 stainless steel stem, aluminum bronze disc, EPDM liner and seal, suitable for bi-directional flow and dead end service with downstream flange removed.

G. Line Shut-Off Valves 4” and larger installed within systems having design operating pressures between 160 and 250 p.s.i.g. shall be threaded lug type ductile iron body butterfly valve with extended neck, lockable lever handle, 316 stainless steel stem and disc, EPDM liner and seal, suitable for bi-directional flow and dead end service with downstream flange removed.

H. Line Shut-Off Valves 4” and larger installed in roll grooved copper systems may be 300 psi roll grooved end type bronze body butterfly valve with lockable lever handle, bronze trim, EPDM coated disc, suitable for bi-directional flow and dead end service. Manufactured by Victaulic Model V-size-3-6-2-2-11.

I. Provide stem extensions of a non-thermal conducting material for valves in insulated lines to allow unobstructed operation.

J. Provide memory stops on all ball valves installed in hot water return lines. Memory stops shall be adjustable after pipe insulation is applied.

K. Provide line shut-off valves that have the same inside diameter of the upstream pipe in which they are installed.

L. Hot Water Return Circuit Balancing Valves 1/2" through 2" shall be ‘Y or T’ pattern with threaded inlet and outlet connections, equal percentage globe-style and provide precise flow measurement, precision flow balancing and positive drip-tight shut-off. Valves shall provide multi-turn, 360° adjustment with micrometer type indicators located on the valve handwheel. Valves shall have a minimum of five full 360° handwheel turns. 90° ‘circuit-setter’ style ball valves are not acceptable. Valve handle shall have hidden memory feature to provide a means for locking the valve position after the system is balanced. Valves shall be furnished with precision machined venturi built into the valve body to provide highly accurate flow measurement and flow balancing. The venturi shall have two, 1/4” threaded brass metering ports with check valves and gasketed caps located on the inlet side of the valve. Valves shall be furnished with flow smoothing fins downstream of the valve seat and integral to the forged valve body to make the flow more laminar. The valve body, stem and plug shall be brass. The handwheel shall be high-strength resin. Provide valves as scheduled on Contract Drawings manufactured by Armstrong Model CBV-VT. Furnish each valve complete with optional pre-formed 25/50 fire/smoke rated insulation.

M. Swing Check Valves, 2” and smaller - “Y” or “T” pattern bronze, Class 150, with threaded connections and screw-in cap.
N.  Spring Loaded Check Valves, 2" and smaller - Silent closing, bronze, Class 125, with threaded connections, Buna disc, bronze or stainless steel spring.

O.  Swing Check Valves, 2-1/2" and larger - 200 pound CWP, Iron body, with bronze or stainless steel trim.

P.  Swing Check Valves, 2-1/2" and larger - 285 pound CWP, Iron body, with stainless steel trim.

Q.  Spring Loaded Check Valves, 2-1/2" and larger - 200 pound CWP, Iron body, with bronze or stainless steel trim.

R.  Spring Loaded Check Valves, 2-1/2" and larger - 400 pound CWP, Iron body, with bronze or stainless steel trim.

2.4 DIFFERENTIAL PRESSURE METER: (For Hot Water Circuit Balancing Valves)

A.  Meter shall be equipped with one 4-1/2" round dial gauge, 0-135" pressure differential, one 4-1/2" round dial gauge, 0-60' pressure differential, 300 psig maximum working pressure, two five foot hoses with PMP connections and carrying case. Meter and accessories shall be manufactured by Armstrong Model CBDM-135/60.

PART 3 - EXECUTION

3.1 Examination

A.  Verify that excavations are to required grade, dry and not over-excavated. Do not install underground piping when bedding is wet or frozen.

B.  Before commencing work, check final grade and pipe invert elevations required for drain terminations and connections to ensure proper slope.

3.2 PREPARATION

A.  Ream pipes and tubes. Remove burrs, scale and dirt, inside and outside, before assembly. Remove foreign material from piping.

B.  Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A.  Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B.  All installation shall be in accordance with manufacturer’s published recommendations.
C. General

1. Care shall be exercised to avoid all cross connections and to construct the plumbing systems in a manner which eliminates the possibility of water contamination.

2. Install all materials and products in accordance with manufacturer’s published recommendations. Use tools manufactured for the installation of the specific material or product.

3. Heat generated by soldering procedures shall not be transmitted to valves, copper alloy roll groove fittings, or any other components installed within the piping system that may be damaged due to high temperatures. Contractor shall take all precautions necessary, including utilizing wet wrapping or allowing heated piping to cool to ambient temperature before attachment.

4. Pipe joints, flanges, unions, etc., shall not directly contact or be encased in concrete, or be located within wall, floor or roof penetrations.

5. Route piping in direct orderly manner and maintain proper grades. Installation shall conserve headroom and interfere as little as possible with use of spaces. Route exposed piping parallel to walls. Group piping whenever practical at common elevations.

6. Install piping to allow for expansion and Contraction without stressing pipe, joints or connected equipment.

7. Furnish all supports required by the piping included in this specification section.

8. Penetrations through fire rated walls, floors and partitions shall be sealed to provide a U.L. rating equal to or greater than the wall, floor or partition.

9. Seal all penetrations through floors, exterior building walls and grade beams air and water tight.

10. Each plumbing pipe projecting through roof shall be installed in accordance with Contract Specifications and Drawings. Penetrations shall be sealed air and water tight. Refer to details on Contract Drawings and coordinate with General Contractor for flashing requirements.

11. Furnish and install all necessary valves, traps, gauges, strainers, unions, backflow preventers, vacuum breakers, etc. for each piece of equipment (including Owner furnished equipment) having plumbing connections, to facilitate proper functioning, servicing and compliance with code.

12. Provide code-approved transition adapters when joining dissimilar piping materials. Adaptors installed shall be manufactured specifically for the particular transition.

13. All piping shall have reducing fittings used for reducing or increasing where any change in the pipe sizes occurs. No bushing of any nature shall be allowed in piping.

14. Bury outside water pipe minimum one foot below recorded frost depth.

15. Buried piping shall be supported throughout its entire length.

16. All excavation required for plumbing work is the responsibility of the plumbing Contractor and shall be done in accordance with Contract Documents.

17. Piping shall be insulated in accordance with Contract Documents.

18. Provide clearance for installation of insulation and for access to valves, air vents, drains, unions, etc.

19. Provide dielectric isolation device where non-ferrous components connect to ferrous components. Devices shall be dielectric union, coupling or dielectric flange fitting.

20. All piping shall be isolated from building structures, including partition studs, to prevent transmission of vibration and noise.
22. On each water supply line serving a plumbing fixture, item of equipment, or other device which has a water supply discharge outlet below the overflow rim, or where cross contamination may occur, provide and install an approved vacuum breaker or backflow preventer. Installation of vacuum breakers shall prevent any possible backflow through them.
23. Provide thrust blocking and clamps for mechanical joint or gasketed underground water pipe at fittings with 3/4" rods, and properly anchor and support. Restraining rods, clamps and hardware shall be thoroughly coated with bituminous material to prevent corrosion.
24. Copper piping shall be supported at no greater than six foot intervals for piping 1-1/2" and smaller and ten foot intervals for piping 2" and larger in diameter.
25. Install all water piping to allow all piping within the system to be drained at low points.
26. Air chambers, dead-legs, or any other piping arrangement that may allow water to stagnate shall not be installed within water systems. Valves installed for future connections shall not extend more than 24" from an active main.
27. Provide manufactured water hammer arrestors in water supply lines as indicated on Contract Drawings and in accordance with Standard PDI-WH201.
28. Pipe insulation shall be applied over installed freeze protection heat tracing tape.
29. Install union type fitting downstream of isolation valves at equipment connections.
30. Threaded adaptors shall be of the same manufacture and type as the system’s copper fittings.
31. Threaded adaptors on supply stub-outs shall be installed prior to construction of wall and shall not extend more than 1” beyond wall face.
32. Water shut-off valves shall be installed where shown on Drawings, at each fixture and piece of equipment, at each branch take-off from mains, at the base of each riser, and at each battery of fixtures.
33. Install shut-off valves in accessible locations. Provide access panels where valves would otherwise be inaccessible. Coordinate quantity, size and location requirements of access panels with General Contractor.
34. Install shut-off valves with stems upright or horizontal, not inverted.
35. Where threaded valves are installed in copper piping systems special care shall be taken to avoid damaging the valve or its parts due to overheating. Install copper or bronze male adapters in each inlet of threaded valves. Sweat-solder adapters to pipe prior to connecting to valve body.
36. Provide spring loaded type check valves on discharge of water pumps.
37. Provide accessible check valves in the individual cold and hot water fixture supply lines serving mixing valve type faucets or assemblies having hose connection outlets that are not equipped with integral check stops.
38. Install hot water return circuit balancing valves where indicated on Contract Drawings and locate a minimum of five pipe diameters downstream and three pipe diameters upstream of all fittings and/or line shut-off valves. Location of valves shall allow unobstructed access for monitoring and adjustment.
39. Adjust and set hot water return circuit balancing valves to flows indicated on Contract Drawings and in accordance with valve manufacturer’s published instructions. Use flow meter recommended by valve manufacturer.
40. Provide a temperature gauge, strainer, union and line shut-off valve upstream of each hot water return circuit balancing valve.
3.4 TESTING

A. General

1. Equipment, material, power, and labor necessary for the cleaning, flushing, sterilization, inspection and testing of systems covered within this Specification Section shall be furnished by the Plumbing Contractor. All testing and inspection procedures shall be in accordance with Division 1 and Special Condition requirements of this Contract.

2. All new and parts of existing altered extended, or repaired plumbing system piping shall be tested and inspected for leaks and defects. Piping being tested shall not leak nor show any loss in test pressure for duration specified.

3. Pressure testing: System shall be hydrostatically pressure tested with potable water to at least 150% maximum working pressure, but at least 150 psig, for 4 hours. For freeze conditions, a 60 psig air test may be applied to metal systems with no incompatible plastic components.

4. Flush, sanitize, adjust and commissioning: Quality tested: Prior to use, the entire system (both lab and domestic, hot and cold) shall be thoroughly flushed, adjusted, commissioned, and sanitized with approved materials compatible with piping-system material, and delivered water-water quality tested by qualified labs.

5. Sanitizing and testing shall be in conformance with (IPC).

6. The water utilized for tests shall be obtained from a potable source of supply.

7. Prepare testing reports. If testing is performed in segments, submit separate report for each segment, complete with diagram or clear description of applicable portion of piping. After inspection has been approved or portions thereof, certify in writing the time, date, name and title of the persons reviewing the test. This shall also include the description of what portion of the system has been approved. Obtain approval signature by Owner's Representative. A complete record shall be maintained of all testing that has been approved, and shall be made available at the job Site. Upon completion of the work, all records and certifications approving testing requirements shall be submitted to the Owner's Representative before final payment is made.

8. Verify systems are complete, flushed and clean prior to testing. Isolate all equipment subject to damage from test pressure. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. Leave piping uninsulated, uncovered and unconcealed until it has been tested and approved. Where any portion of piping system must be concealed before completion of entire system, the portion shall be tested separately as specified for the entire system prior to concealment. Contractor shall expose all untested covered or concealed piping.

9. Gauges used for testing shall have increments as follows:

   a. Tests requiring a pressure of 10 psi or less shall utilize a testing gauge having increments of 0.10 psi or less.
   b. Tests requiring a pressure of greater than 10 psi but less than or equal to 100 psi shall utilize a testing gauge having increments of 1 psi or less.
   c. Tests requiring a pressure of greater than 100 psi shall utilize a testing gauge having increments of 2 psi or less.

10. Separately test above and below ground piping.

11. Do not introduce test water into piping systems when exposure to freezing temperatures is possible.
12. Do not introduce test water into sections of piping located above existing sensitive areas and/or equipment that may be damaged or contaminated by water leakage. Coordinate with Owner’s Representative to determine areas and/or equipment considered as being sensitive.

13. Defective work or material shall be reworked and replaced, and inspection and test repeated. Repairs shall be made with new materials. Pipe dope, caulking, tape, dresser couplings, etc., shall not be used to correct deficiencies.

14. The Contractor shall be responsible for cleaning up any leakage during flushing, testing, repairing and disinfecting to the original condition any building parts subjected to spills or leakage.

15. Coordinate with the commissioning process relative to notification and documentation completion and submission.

B. Water System

1. During test period, all pipe, fittings and accessories in the particular piping system that is being tested shall be carefully inspected. If leaks are detected, such leaks shall be stopped and the hydrostatic test shall again be applied. This procedure shall be repeated until no leaks are detected for an entire 12 hour period. EXCEPTION: Piping located above sensitive areas and/or equipment that may be damaged or become contaminated due to test water leakage shall be tested with oil-free air in lieu of water.

2. After completion of the testing, all new and/or altered water piping systems shall be thoroughly sterilized with a solution containing not less than 50 parts per million of available chlorine. Do not exceed 150 parts per million at any time. Introduce chlorine into the supply stream at a rate sufficient to provide a uniform concentration throughout the system. All outlets shall be opened and closed several times. When the specified level of chlorine is detected at every outlet in the system, close all valves to prevent release of water from the system for 24 hours. At the completion of the 24 hour disinfection period, test every outlet for a minimum chlorine residual of fifty parts per million. This minimum residual must be present to proceed with flushing. Flush the system with clean water at a sufficient velocity until the residual chlorine detected at every outlet is within 0.2 parts per million of the normal water supply’s level.

3. “Sufficient samples must be taken no sooner than 24 hours after sterilization and flushing to represent the extent and complexity of the affected water syst-tem, along with a control sample to indicate municipal water quality at the time of testing. Send water samples to an accredited laboratory to perform qualitative and quantitative bacteriological analysis in accordance with AWWA C651. Contractor shall obtain written certification from the independent testing agency stating that the water samples meet Federal and State guidelines for safe drinking water. Upon satisfactory completion of all procedures, and receipt of acceptable laboratory test results, forward the sample results to the DOHS Drinking Water Safety Program Manager for review and approval. Failure to fully comply with the above procedures will result in a requirement to repeat the procedure until acceptable results are achieved, at no additional cost to the Owner. “Isolate or bypass equipment that would be detrimentally affected by disinfecting solution. Isolate all other sections of the water system not being disinfected to prevent migration of chlorine.

4. Prior to injection of chlorine into the piping system, strategically place signs stating “Heavily Chlorinated Water - Do Not Drink”, and protect all outlets to prevent use during disinfection and flushing procedures.
SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Backflow preventers.
5. Temperature-actuated water mixing valves.
6. Drain valves.
7. Water hammer arresters.
8. Trap-seal primer valves.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Field quality-control test reports.
C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. NSF Compliance:

2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."
3. Comply with NSF 61, "Commercial Hot Classification" for all hot water system components.
PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Ames Co.
   b. Cash Acme.
   c. Conbraco Industries, Inc.
   d. FEBCO; SPX Valves & Controls.
   e. Rain Bird Corporation.
   f. Toro Company (The); Irrigation Div.
   g. Watts Industries, Inc.; Water Products Div.
   h. Zurn Plumbing Products Group; Wilkins Div.

3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Chrome plated.

2.2 BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Cash Acme.
   b. Conbraco Industries, Inc.
   c. FEBCO; SPX Valves & Controls.
   d. Honeywell Water Controls.
   e. Legend Valve.
   g. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1012.
3. Operation: Continuous-pressure applications.
5. End Connections: Union, solder joint.
6. Finish: Chrome plated.

B. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Ames Co.
   b. Cash Acme.
   c. Conbraco Industries, Inc.
   d. FEBCO; SPX Valves & Controls.
   e. Rain Bird Corporation.
   f. Toro Company (The); Irrigation Div.
   g. Watts Industries, Inc.; Water Products Div.
   h. Zurn Plumbing Products Group; Wilkins Div.

3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Chrome plated.
a. Ames Co.
b. Conbraco Industries, Inc.
c. FEBCO; SPX Valves & Controls.
d. Flomatic Corporation.
e. Watts Industries, Inc.; Water Products Div.
f. Zurn Plumbing Products Group; Wilkins Div.

3. Operation: Continuous-pressure applications.
4. Pressure Loss: 10 psig maximum, through middle 1/3 of flow range.
5. Design Flow Rate: As noted on drawings.
6. Selected Unit Flow Range Limits: As noted on drawings.
7. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved or steel with interior lining complying with AWWA C550 or that is FDA approved or stainless steel 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: As noted on drawings.
10. Accessories:

   a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.

C. Double-Check Backflow-Prevention Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Ames Co.
   b. Conbraco Industries, Inc.
   c. FEBCO; SPX Valves & Controls.
   d. Flomatic Corporation.
   e. Watts Industries, Inc.; Water Products Div.
   f. Zurn Plumbing Products Group; Wilkins Div.

3. Operation: Continuous-pressure applications, unless otherwise indicated.
4. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
5. Size: As noted on drawings.
6. Design Flow Rate: As noted on drawings.
7. Selected Unit Flow Range Limits: As noted on drawings.
8. Pressure Loss at Design Flow Rate: As noted on drawings.
9. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved or steel with interior lining complying with AWWA C550 or that is FDA approved or stainless steel for NPS 2-1/2 and larger.
10. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
11. Configuration: As noted on drawings.
12. Accessories:
   a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.

D. Backflow-Preventer Test Kits:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Conbraco Industries, Inc.
   b. FEBCO; SPX Valves & Controls.
   c. Flomatic Corporation.
   e. Zurn Plumbing Products Group; Wilkins Div.
2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.3 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Cash Acme.
   b. Conbraco Industries, Inc.
   c. Honeywell Water Controls.
   e. Zurn Plumbing Products Group; Wilkins Div.
4. Size: As noted on drawings.
5. Design Flow Rate: As noted on drawings.
6. Body: Bronze with chrome-plated finish 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 NPS 3.
8. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.
2.4 BALANCING VALVES

A. Memory-Stop Balancing Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Conbraco Industries, Inc.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Div.
   e. Hammond Valve.
   f. Milwaukee Valve Company.
   g. NIBCO INC.
   h. Red-White Valve Corp.
4. Pressure Rating: 400-psig minimum CWP.
5. Size: NPS 2 or smaller.
7. Port: Standard or full port.
8. Ball: Chrome-plated brass.
10. End Connections: Solder joint or threaded.
11. Handle: Vinyl-covered steel with memory-setting device.

2.5 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Water-Temperature Limiting Devices:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Cash Acme.
   c. Conbraco Industries, Inc.
   d. Honeywell Water Controls.
   e. Legend Valve.
   f. Leonard Valve Company.
   g. Powers; a Watts Industries Co.
   h. Symmons Industries, Inc.
   i. Taco, Inc.
   k. Zurn Plumbing Products Group; Wilkins Div.
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. Domestic Tempered-Water Setting: 125-130 deg F.
9. Laboratory Tempered-Water Setting: 131-140 deg F.
10. Tempered-Water Design Flow Rate: As noted on drawings.
11. Valve Finish: Chrome plated or Rough bronze (where concealed).

B. Primary, Thermostatic, Water Mixing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Lawler Manufacturing Company, Inc.
   c. Leonard Valve Company.
   d. Powers; a Watts Industries Co.
   e. Symmons Industries, Inc.

4. Type: Exposed-mounting or Cabinet-type as noted on drawings, thermostatically controlled water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Valve Pressure Rating: 125 psig minimum, unless otherwise indicated.
10. Laboratory Tempered-Water Setting: 131-140 deg F.
11. Tempered-Water Design Flow Rate: As noted on drawings.
12. Pressure Drop at Design Flow Rate: As noted on drawings.
13. Valve Finish: Chrome plated or Rough bronze (where concealed).
15. Cabinet: Factory-fabricated, stainless steel, for recessed or surface mounting as noted on drawings and with hinged, stainless-steel door.

2.6 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

2. Pressure Rating: 400-psig minimum CWP.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
8. Inlet: Threaded or solder joint.

2.7 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AMTROL, Inc.
   b. Josam Company.
   c. MIFAB, Inc.
   d. PPP Inc.
   e. Sioux Chief Manufacturing Company, Inc.
   g. Tyler Pipe; Wade Div.
   h. Watts Drainage Products Inc.
   i. Zurn Plumbing Products Group; Specification Drainage Operation.

3. Type: Metal bellows or Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F. For high flow applications the unit shall be sized by the Engineer of Record for an industrial grade arrestor.

2.8 ELECTRONIC TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:

1. Automatically maintains a constant water seal in floor drain traps 4 to 8 opening configurations. Contractor to coordinate locations with floor plans.
2. Unit shall be provide with atmospheric vacuum breaker, pre-set 24 hour adjustable timer, manual over ride switch, 3 wire single point connection, ¾" FNPT connection, calibrated manifold for equal water distribution, ½ outlet compression fittings.
3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Mifab Inc.
   b. PPP Inc.
   c. Sioux Chief Manufacturing Company, Inc.
   d. Zurn Industries
5. Pressure Rating: 125 psig minimum.
8. Outlet connection: NPS 1/2 threaded, union, or solder joint.
9. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
10. Cabinet: Model PT-4, PT-12 16 gauge steel, galvanized.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install 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 not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

C. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

D. Install balancing valves in locations where they can easily be adjusted.

E. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install thermometers and water regulators if specified.
2. Install cabinet-type units recessed in or surface mounted on wall as specified.

F. Install water hammer arresters in water piping according to PDI-WH 201.

G. 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.

H. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

I. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
1. Intermediate atmospheric-vent backflow preventers.
2. Reduced-pressure-principle backflow preventers.
5. Primary, thermostatic, water mixing valves.

J. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each reduced-pressure-principle backflow preventer and double-check backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.3 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 221119
SECTION 221316
SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.
3. Encasement for underground metal piping.

B. Related Requirements:

1. Section 221313 "Facility Sanitary Sewers" for sanitary sewerage piping and structures outside the building.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For hubless, single-stack drainage system. Include plans, elevations, sections, and details.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For waste and vent piping, 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. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.
1.5 FIELD CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:


B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 PIPING MATERIALS

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class(es).

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.

C. CISPI, Hubless-Piping Couplings:
   2. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

D. Heavy-Duty, Hubless-Piping Couplings:
   2. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

E. Cast-Iron, Hubless-Piping Couplings:
   2. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.5 GALVANIZED-STEEL PIPE AND FITTINGS

A. Galvanized-Steel Pipe: ASTM A 53/A 53M, Type E, Standard Weight class. Include square-cut-grooved or threaded ends matching joining method.


   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.

D. Grooved-Joint, Galvanized-Steel-Pipe Appurtenances:
   2. Grooved Mechanical Couplings for Galvanized-Steel Piping: ASTM F 1476, Type I. Include ferrous housing sections with continuous curved keys; EPDM-rubber gasket suitable for hot and cold water; and bolts and nuts.

2.6 STAINLESS-STEEL PIPE AND FITTINGS

A. Pipe and Fittings: ASME A112.3.1, drainage pattern with socket and spigot ends.

B. Internal Sealing Rings: Elastomeric gaskets shaped to fit socket groove.
2.7 DUCTILE-IRON PIPE AND FITTINGS

A. Ductile-Iron, Mechanical-Joint Piping:
   1. Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell and plain spigot ends unless grooved or flanged ends are indicated.
   3. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Ductile-Iron, Push-on-Joint Piping:
   1. Ductile-Iron Pipe: AWWA C151/A21.51, with push-on-joint bell and plain spigot ends unless grooved or flanged ends are indicated.

C. Ductile-Iron, Grooved-Joint Piping: AWWA C151/A21.51, with round-cut-grooved ends according to AWWA C606.

D. Ductile-Iron, Grooved-End Pipe Appurtenances:
   2. Grooved Mechanical Couplings for Ductile-Iron Pipe: ASTM F 1476, Type I. Include ferrous housing sections with continuous curved keys; EPDM-rubber center-leg gasket suitable for hot and cold water; and bolts and nuts.

2.8 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. Hard Copper Tube: ASTM B 88, Type L and Type M, water tube, drawn temper.

D. Soft Copper Tube: ASTM B 88, Type L, water tube, annealed temper.

E. Copper Pressure Fittings:
   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.
F. 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.

G. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.9 ABS PIPE AND FITTINGS


B. Solid-Wall ABS Pipe: ASTM D 2661, Schedule 40.


D. ABS Socket Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste, and vent patterns.

E. Solvent Cement: ASTM D 2235.

2.10 PVC PIPE AND FITTINGS


B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

C. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.

D. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

E. Adhesive Primer: ASTM F 656.

F. Solvent Cement: ASTM D 2564.

2.11 SPECIALTY PIPE FITTINGS

A. Transition Couplings:
   1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
   2. Unshielded, Nonpressure Transition Couplings:
SANITARY WASTE AND VENT PIPING

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b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
c. End Connections: Same size as and compatible with pipes to be joined.
d. Sleeve Materials:

2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

3. Shielded, Nonpressure Transition Couplings:

b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
c. End Connections: Same size as and compatible with pipes to be joined.

4. Pressure Transition Couplings:

b. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
c. Center-Sleeve Material: Ductile iron.
d. Gasket Material: Natural or synthetic rubber.
e. Metal Component Finish: Corrosion-resistant coating or material.

B. Dielectric Fittings:

1. Dielectric Unions:

a. Description:

1) Standard: ASSE 1079.
2) Pressure Rating: 125 psig minimum at 180 deg F.
3) End Connections: Solder-joint copper alloy and threaded ferrous.

2. Dielectric Flanges:

a. Description:

1) Standard: ASSE 1079.
2) Factory-fabricated, bolted, companion-flange assembly.
3) Pressure Rating: 125 psig minimum at 180 deg F.
4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

3. Dielectric-Flange Insulating Kits:

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a. Description:

1) Nonconducting materials for field assembly of companion flanges.
2) Pressure Rating: 150 psig.
3) Gasket: Neoprene or phenolic.
4) Bolt Sleeves: Phenolic or polyethylene.
5) Washers: Phenolic with steel backing washers.

4. Dielectric Nipples:

a. Description:

1) Standard: IAPMO PS 66.
2) Electroplated steel nipple.
3) Pressure Rating: 300 psig at 225 deg F.
4) End Connections: Male threaded or grooved.
5) Lining: Inert and noncorrosive, propylene.

2.12 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Standard: ASTM A 674 or AWWA C105/A 21.5.

B. Material: Linear low-density polyethylene film of 0.008-inch or high-density, cross-laminated polyethylene film of 0.004-inch minimum thickness.

C. Form: Sheet or tube.

D. Color: Black or natural.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

   1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.

   2. Install piping as indicated unless deviations to layout are approved on coordination drawings.
B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
   1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
   2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
      
      a. Straight tees, elbows, and crosses may be used on vent lines.
   3. Do not change direction of flow more than 90 degrees.
   4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
      
      a. Reducing size of waste piping in direction of flow is prohibited.

K. Lay buried building waste piping beginning at low point of each system.
   1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
   2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
   3. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
   1. Building Sanitary Waste: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
   2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
   1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.

N. Install steel piping according to applicable plumbing code.

O. Install stainless-steel piping according to ASME A112.3.1 and applicable plumbing code.

P. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

Q. Install aboveground ABS piping according to ASTM D 2661.

R. Install aboveground PVC piping according to ASTM D 2665.

S. Install underground ABS and PVC piping according to ASTM D 2321.

T. Install engineered soil and waste and vent piping systems as follows:
   3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

U. Install underground, ductile-iron, force-main piping according to AWWA C600.
   1. Install buried piping inside building between wall and floor penetrations and connection to sanitary sewer piping outside building with restrained joints.
   2. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
   3. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.

V. Install underground, copper, force-main tubing according to CDA's "Copper Tube Handbook."
   1. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.

W. Install force mains at elevations indicated.

X. Plumbing Specialties:
   1. Install backwater valves in sanitary waster gravity-flow piping.
      a. Comply with requirements for backwater valves specified in Section 221319 "Sanitary Waste Piping Specialties."
2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
   a. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
   b. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."

3. Install drains in sanitary waste gravity-flow piping.
   a. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."

Y. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

Z. Install sleeves for piping penetrations of walls, ceilings, and floors.
   1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

AA. Install sleeve seals for piping penetrations of concrete walls and slabs.
   1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

BB. Install escutcheons for piping penetrations of walls, ceilings, and floors.
   1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION


C. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1.
   1. Cut threads full and clean using sharp dies.
   2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
      a. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
c. Do not use pipe sections that have cracked or open welds.

E. Join stainless-steel pipe and fittings with gaskets according to ASME A112.3.1.

F. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

G. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

H. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

I. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 appendixes.

3.4 VALVE INSTALLATION

A. Comply with requirements in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping" for general-duty valve installation requirements.

B. Shutoff Valves:

1. Install shutoff valve on each sewage pump discharge.
2. Install gate or full-port ball valve for piping NPS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

D. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.
3. Install backwater valves in accessible locations.
3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install 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.

C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

F. 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.

G. Install supports for vertical cast-iron soil piping every 15 feet.
H. 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.

I. Install supports for vertical steel piping every 15 feet.

J. 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.

K. Install supports for vertical stainless-steel piping every 10 feet.

L. 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.

M. Install supports for vertical copper tubing every 10 feet.

N. Install hangers for ABS and PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
2. NPS 3: 48 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 48 inches with 7/8-inch rod.

O. Install supports for vertical ABS and PVC piping every 48 inches.

P. 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.
5. Install horizontal backwater valves with cleanout cover flush with floor.
6. Comply with requirements for cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
7. Equipment: Connect waste piping as indicated.
   a. Provide shutoff valve if indicated and union for each connection.
   b. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Connect force-main piping to the following:

1. Sanitary Sewer: To exterior force main.
2. Sewage Pump: To sewage pump discharge.

E. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

F. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."
3.8 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.

E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved.
   a. Expose work that was covered or concealed before it was tested.

2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials.
   a. Isolate test source and allow to stand for four hours.
   b. Leaks and loss in test pressure constitute defects that must be repaired.

3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
4. Prepare reports for tests and required corrective action.

3.9 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. Exposed ABS and PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

E. Repair damage to adjacent materials caused by waste and vent piping installation.

3.10 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 the following:

   1. ABS pipe, ABS socket fittings, and solvent-cemented joints.
   2. PVC pipe, PVC socket fittings, and solvent-cemented joints.
   3. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   4. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
C. Aboveground, vent piping NPS 4 and smaller shall be any of the following:

1. ABS pipe, ABS socket fittings, and solvent-cemented joints
2. PVC pipe, PVC socket fittings, and solvent-cemented joints.
3. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
4. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
5. Galvanized-steel pipe, drainage fittings, and threaded joints.

D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:

1. ABS pipe, ABS socket fittings, and solvent-cemented joints.
2. PVC pipe, PVC socket fittings, and solvent-cemented joints.
3. Service class, cast-iron soil piping; gaskets; and gasketed joints.
4. Hubless, cast-iron soil pipe and fittings; cast-iron hubless-piping couplings; and coupled joints.
5. Stainless-steel pipe and fittings, gaskets, and gasketed joints.

END OF SECTION 221316
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. Cleanouts.
   2. Through-penetration firestop assemblies.

1.3 DEFINITIONS

B. PVC: Polyvinyl chloride.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For sanitary waste piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.
B. Comply with NSF 14 for plastic sanitary waste piping specialty components.
C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing, and marked for intended location and application.
2.2 CLEANOUTS

A. Cast-Iron Exposed Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Josam Company.
   c. MIFAB, Inc.
   d. WATTS.
   e. Zurn

2. Standard: ASME A112.36.2M.

3. Size: Same as connected drainage piping
5. Closure: Countersunk plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Stainless-Steel Exposed Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Josam Company.
   c. MIFAB, Inc.
   d. WATTS.
   e. Zurn

2. Standard: ASME A112.3.1.

3. Size: Same as connected drainage piping
4. Body Material: Stainless-steel tee with side cleanout as required to match connected piping.
5. Closure: Stainless-steel plug with seal.

C. Cast-Iron Exposed Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Josam Company.
   c. Zurn.

2. Standard: ASME A112.36.2M for adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Adjustable housing.
5. Body or Ferrule: Cast iron.
8. Frame and Cover Shape: Round.
10. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

D. Stainless-Steel Exposed Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Josam Company.
   c. MIFAB, Inc.
   d. WATTS.
   e. Zurn

2. Standard: ASME A112.36.2M for adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Adjustable housing.
5. Body or Ferrule: Cast iron.
8. Frame and Cover Shape: Round.

E. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Josam Company.
   c. MIFAB, Inc.
   d. WATTS.
   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. 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.

F. Plastic Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Canplas LLC.
   b. Plastic Oddities.
   c. Sioux Chief Manufacturing Company, Inc.

2. Size: Same as connected branch.
3. Body: PVC.
4. Closure Plug: PVC.
5. Riser: Drainage pipe fitting and riser to cleanout of same material as drainage piping.

2.3 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

2. Size: Same as connected soil, waste, or vent stack.
3. Sleeve: Molded-PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.

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.

2.5 MOTORS

A. General requirements for motors are specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, motor shall be large enough, so driven load will not require motor to operate in service factor range above 1.0.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Mounting:

1. Comply with requirements for vibration-isolation and seismic-control devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
2. Comply with requirements for vibration-isolation devices specified in Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."

B. Install backwater valves in building drain piping.

1. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.
C. 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.

D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

E. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

F. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.

1. Comply with requirements in Section 078413 "Penetration Firestopping."

G. Assemble open drain fittings and install with top of hub 2 inches above floor.

H. Install deep-seal traps on floor drains and other waste outlets, if indicated.

I. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

J. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

K. Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane.

L. Install vent caps on each vent pipe passing through roof.

M. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

N. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

O. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

P. Assemble components of FOG disposal systems and install on floor.

1. Install trap, vent, fresh-air inlet, and flow-control fitting according to authorities having jurisdiction.
2. Install shelf fastened to reinforcement in wall construction and adjacent to unit, unless otherwise indicated.
3. Install culture bottle, culture metering pump, timer, and control on shelf. Install tubing between culture bottle, metering pump, and chamber.

Q. Install wood-blocking reinforcement for wall-mounting-type specialties.
R. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS
A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
B. Install piping adjacent to equipment to allow service and maintenance.
C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 LABELING AND IDENTIFYING
A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.
1. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL
A. Tests and Inspections:
1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 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
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. General Sinks
   2. Supply fittings
   3. Waste fittings

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted plumbing fixtures.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 Plumbing Fixtures and Trim

A. Manufacturers and model numbers shall be as specified herein or on the contract drawings. Not all fixtures are listed herein. See drawings for additional fixture information and requirements. Vitreous-china and enameled cast-iron plumbing fixtures shall be white, and except where noted otherwise, shall be the product of the same manufacturer.
B. Exposed traps and double-cone supply tubes for fixtures and equipment shall be connected to rough-piping at the wall or deck, unless otherwise specified in the contract documents. Floor and wall plates shall be as specified herein or as covered by schedules on project drawings. Exposed-to-view fixture trimmings, fittings, and fasteners shall be chromium-plated or nickel-plated brass with polished, bright surfaces.

C. Supplies and wastes for lavatories shall be to wall or floor, except as otherwise indicated on the construction drawings. Sleeves are not required at fixture penetrations.

D. Rubber compression type connections shall not be acceptable. Brass ferrule type fittings shall be required.

2.2 Fixture Supports

A. Wall-hung fixtures shall be supported by ferrous-metal carriers suited to the particular installation conditions. Carriers may be combination type with adjustable fittings. Water closets and urinals shall have supporting feet not less than 10 inches long. Lavatories shall be supported from the wall by wall-carriers with concealed arms.

2.3 GROUT


B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install plumbing fixtures level and plumb according to roughing-in drawings.

B. Install counter-mounting fixtures in and attached to casework.

C. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Comply with valve requirements specified in Division 22 Section "General-Duty Valves for Plumbing Piping."
D. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

E. Install traps on fixture outlets.
   1. Exception: Omit trap on fixtures with integral traps.
   2. Exception: Omit trap on indirect wastes unless otherwise indicated.

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Division 22 Section "Plumbing Piping Insulation."

G. 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 Division 22 Section "Escutcheons for Plumbing Piping."

H. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Division 07 Section "Joint Sealants."

3.2 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Division 22 Section "Domestic and Laboratory Water Piping."

C. Comply with soil and waste piping requirements specified in Division 22 Section "Chemical – Waste Systems for Laboratory Facilities."

D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Division 22 Section "Plumbing Piping Insulation."

3.3 ADJUSTING

A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.4 CLEANING AND PROTECTION

A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.

B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
C.  Provide protective covering for installed plumbing fixtures and fittings.

D.  Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224100
SECTION 230517
SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes:
   1. Sleeves.
   2. Stack-sleeve fittings.
   3. Sleeve-seal systems.
   4. Sleeve-seal fittings.
   5. Grout.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES
A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

2.2 STACK-SLEEVE FITTINGS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.
B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.
1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Presealed Systems.

B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT


B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch (25-mm) annular clear space between piping and concrete slabs and walls.
1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.
   a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level.
3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 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 (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and
Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION
A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
C. Secure nailing flanges to concrete forms.
D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE
A. Use sleeves and sleeve seals for the following piping-penetration applications:
1. Exterior Concrete Walls above Grade:
   b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel wall sleeves Galvanized-steel-pipe sleeves.

2. Interior Partitions:
   b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-sheet sleeves.
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Escutcheons.
   2. Floor plates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed and exposed-rivet hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.
3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:
   a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
   b. Chrome-Plated Piping: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
   c. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
   d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
   e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
   f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
   g. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
   h. Bare Piping in Equipment Rooms: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.

2. Escutcheons for Existing Piping:
   a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
   b. Insulated Piping: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
   c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
   d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
   e. Bare Piping in Unfinished Service Spaces: Split-casting brass type with polished, chrome-plated finish.
   f. Bare Piping in Equipment Rooms: Split-casting brass type with polished, chrome-plated finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.
SECTION 230519
METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes:
   1. Bimetallic-actuated thermometers.
   2. Filled-system thermometers.
   4. Duct-thermometer mounting brackets.
   5. Thermowells.
   6. Dial-type pressure gages.
   7. Gage attachments.
   8. Test plugs.
  10. Sight flow indicators.

B. Related Requirements:
   1. Section 231123 "Facility Natural-Gas Piping" for gas meters.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Shop Drawings:
   1. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS
A. Product Certificates: For each type of meter and gage.

1.5 CLOSEOUT SUBMITTALS
A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.
PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Ashcroft Inc.
2. Ernst Flow Industries.
3. Marsh Bellofram.
8. REOTEMP Instrument Corporation.
10. Trerice, H. O. Co.
11. Watts; a Watts Water Technologies company.
12. Weiss Instruments, Inc.
13. Weksler Glass Thermometer Corp.
14. WIKA Instrument Corporation.


C. Case: Liquid-filled and sealed type(s); stainless steel with 5-inch nominal diameter.

D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F.

E. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

F. Connector Size: 1/2 inch, with ASME B1.1 screw threads.

G. Stem: 0.25 or 0.375 inch in diameter; stainless steel.

H. Window: Plain glass.

I. Ring: Stainless steel.

J. Element: Bimetal coil.

K. Pointer: Dark-colored metal.

L. Accuracy: Plus or minus 1.5 percent of scale range.

2.2 FILLED-SYSTEM THERMOMETERS

A. Direct-Mounted, Metal-Case, Vapor-Actuated Thermometers:

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. Ashcroft Inc.
b. Marsh Bellofram.
c. Miljoco Corporation.
e. REOTEMP Instrument Corporation.
f. Trerice, H. O. Co.
g. Weiss Instruments, Inc.

3. Case: Sealed type, cast aluminum or drawn steel; 5-inch nominal diameter.
4. Element: Bourdon tube or other type of pressure element.
5. Movement: Mechanical, dampening type, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
8. Window: Glass.
10. Connector Type(s): Union joint, adjustable, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device 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.
   b. Design for Thermowell Installation: Bare stem.
12. Accuracy: Plus or minus 1 percent of scale range.

2.3 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:
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. Trerice, H. O. Co.
3. Case: Cast aluminum; 6-inch nominal size.
4. Case Form: Back angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Window: Glass or plastic.
8. Stem: Aluminum or brass and of length to suit installation.
   b. Design for Thermowell Installation: Bare stem.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.
2.4 DUCT-THERMOMETER MOUNTING BRACKETS

A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.5 THERMOWELLS

A. Thermowells:

2. Description: Pressure-tight, socket-type fitting made for insertion in piping tee fitting.
3. Material for Use with Copper Tubing: CNR.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.6 DIAL-TYPE PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

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:
   b. Trerice, H. O. Co.
   c. Watts; a Watts Water Technologies company.
   d. Weiss Instruments, Inc.
3. Case: Liquid-filled Sealed type(s); cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.
2.7 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Siphons: Loop-shaped section of stainless-steel pipe with NPS 1/4 or NPS 1/2 pipe threads.

C. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

2.8 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Flow Design, Inc.
3. Nexus Valve, Inc.
4. Peterson Equipment Co., Inc.
5. Sisco Manufacturing Company, Inc.
6. Trerice, H. O. Co.
7. Watts; a Watts Water Technologies company.
8. Weiss Instruments, Inc.
9. Weksler Glass Thermometer Corp.

B. Description: Test-station fitting made for insertion in 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.

2.9 TEST-PLUG KITS

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. Flow Design, Inc.
3. Nexus Valve, Inc.
4. Peterson Equipment Co., Inc.
5. Sisco Manufacturing Company, Inc.
6. Trerice, H. O. Co.
7. Watts; a Watts Water Technologies company.
8. Weiss Instruments, Inc.

B. Furnish one test-plug kit(s) containing one thermometer(s), one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.
C. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch-diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F.

D. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch-diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F.

E. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch-diameter dial and probe. Dial range shall be at least 0 to 200 psig.

F. Carrying Case: Metal or plastic, with formed instrument padding.

2.10 SIGHT FLOW INDICATORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. ARCHON Industries, Inc.
2. Dwyer Instruments, Inc.
3. Emerson Process Management; Rosemount Division.
4. Ernst Flow Industries.
5. John C. Ernst Co., Inc.
6. KOBOLD Instruments, Inc. - USA.
7. OPW Engineered Systems; OPW Fluid Transfer Group; a Dover company.
8. Pentair Valves & Controls; Penberthy Brand.

B. Description: Piping inline-installation device for visual verification of flow.

C. Construction: Bronze or stainless-steel body, with sight glass and ball, flapper, or paddle wheel indicator, and threaded or flanged ends.

D. Minimum Pressure Rating: 150 psig.

E. Minimum Temperature Rating: 200 deg F.

F. End Connections for NPS 2 and Smaller: Threaded.

G. End Connections for NPS 2-1/2 and Larger: Flanged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending a minimum of 2 inches into fluid and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.
E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.

H. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

I. Install remote-mounted pressure gages on panel.

J. Install valve and snubber in piping for each pressure gage for fluids.

K. Install test plugs in piping tees.

L. Install flow indicators in piping systems in accessible positions for easy viewing.

M. Assemble and install connections, tubing, and accessories between flow-measuring elements and flowmeters according to manufacturer's written instructions.

N. Install permanent indicators on walls or brackets in accessible and readable positions.

O. Install connection fittings in accessible locations for attachment to portable indicators.

P. Mount thermal-energy meters on wall if accessible; if not, provide brackets to support meters.

Q. Install thermometers in the following locations:
   1. Inlet and outlet of each hydronic zone.
   2. Inlet and outlet of each hydronic boiler.
   3. Two inlets and two outlets of each chiller.
   4. Inlet and outlet of each hydronic coil in air-handling units.
   5. Two inlets and two outlets of each hydronic heat exchanger.
   6. Inlet and outlet of each thermal-storage tank.
   7. Outside-, return-, supply-, and mixed-air ducts.

R. Install pressure gages in the following locations:
   1. Discharge of each pressure-reducing valve.
   2. Inlet and outlet of each chiller chilled-water and condenser-water connection.
   3. Suction and discharge of each pump.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow space for service and maintenance of meters, gages, machines, and equipment.

B. Connect flowmeter-system elements to meters.

C. Connect flowmeter transmitters to meters.

D. Connect thermal-energy meter transmitters to meters.
3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer’s written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each hydronic zone shall be one of the following:
   1. Liquid-filled Sealed, bimetallic-actuated type.
   5. Test plug with EPDM self-sealing rubber inserts.

B. Thermometers at inlet and outlet of each hydronic boiler shall be one of the following:
   1. Liquid-filled Sealed, bimetallic-actuated type.
   5. Test plug with EPDM self-sealing rubber inserts.

C. Thermometers at inlets and outlets of each chiller shall be one of the following:
   1. Liquid-filled Sealed, bimetallic-actuated type.
   5. Test plug with EPDM self-sealing rubber inserts.

D. Thermometers at inlet and outlet of each hydronic coil in air-handling units and built-up central systems shall be one of the following:
   1. Liquid-filled Sealed, bimetallic-actuated type.
   5. Test plug with EPDM self-sealing rubber inserts.

E. Thermometers at outside-, return-, supply-, and mixed-air ducts shall be one of the following:
   1. Liquid-filled Sealed, bimetallic-actuated type.

F. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Chilled-Water Piping: Minus 40 to plus 160 deg F.
B. Scale Range for Condenser-Water Piping: 0 to 100 deg F.
C. Scale Range for Heating, Hot-Water Piping: 0 to 250 deg F.
D. Scale Range for Air Ducts: Minus 40 to plus 110 deg F.

3.6 PRESSURE-GAGE SCHEDULE
A. Pressure gages at discharge of each pressure-reducing valve shall be one of the following:
   1. Liquid-filled Sealed, direct-mounted, metal case.
   2. Sealed, direct-mounted, plastic case.
   3. Test plug with EPDM self-sealing rubber inserts.
B. Pressure gages at inlet and outlet of each chiller chilled-water and condenser-water connection shall be one of the following:
   1. Liquid-filled Sealed, direct-mounted, metal case.
   2. Sealed, direct-mounted, plastic case.
   3. Test plug with EPDM self-sealing rubber inserts.
C. Pressure gages at suction and discharge of each pump shall be one of the following:
   1. Liquid-filled Sealed, direct-mounted, metal case.
   2. Sealed, direct-mounted, plastic case.
   3. Test plug with EPDM self-sealing rubber inserts.

3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE
A. Scale Range for Chilled-Water Piping: 30-in. Hg to 15 psi.
B. Scale Range for Condenser-Water Piping: 30-in. Hg to 15 psi.
C. Scale Range for Heating, Hot-Water Piping: 30-in. Hg to 15 psi.

END OF SECTION 230519
SECTION 230523.12
BALL VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Bronze ball valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, and weld ends.

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.
   6. ASME B31.1 for power piping valves.
   7. ASME B31.9 for building services piping valves.

C. 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.

D. Refer to HVAC valve schedule articles for applications of valves.

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 handle of nonthermal-conductive material, and protective sleeves that allow operation of valves without breaking the vapor seals or disturbing insulation.
   3. Memory stops that are fully adjustable after insulation is applied.

I. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

A. Bronze Ball Valves, Two-Piece with Full Port and Bronze or Brass Trim:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. American Valve, Inc.
      b. Apollo Valves; Conbraco Industries, Inc.
      c. Crane; Crane Energy Flow Solutions.
      d. Hammond Valve.
      e. Lance Valves.
      f. Legend Valve & Fitting, Inc.
      g. Milwaukee Valve Company.
      h. Red-White Valve Corporation.
      i. Watts; a Watts Water Technologies company.
   2. Description:
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install valve tags. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for valve tags and schedules.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified SWP classes or CWP ratings are unavailable, the same types of valves with higher SWP classes or CWP ratings may be substituted.

B. Select valves with the following end connections:
1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Steel Piping, NPS 2 and Smaller: Threaded ends.

3.4 CHILLED-WATER VALVE SCHEDULE
   A. Pipe NPS 2 and Smaller: bronze ball valves, two piece, with bronze trim, and full port.
      1. Valves may be provided with solder-joint ends instead of threaded ends.

3.5 CONDENSER-WATER VALVE SCHEDULE
   A. Pipe NPS 2 and Smaller: bronze ball valves, two piece with bronze trim, and full port.
      1. Valves may be provided with solder-joint ends instead of threaded ends.

3.6 HEATING-WATER VALVE SCHEDULE
   A. Pipe NPS 2 and Smaller: bronze ball valves, two piece with bronze trim, and full port.
      1. Valves may be provided with solder-joint ends instead of threaded ends.

3.7 MAKE-UP-WATER VALVE SCHEDULE
   A. Pipe NPS 2 and Smaller: bronze ball valves, two piece with bronze trim, and full port.
      1. Valves may be provided with solder-joint ends instead of threaded ends.

END OF SECTION 230523.12
SECTION 230529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Metal pipe hangers and supports.
   2. Trapeze pipe hangers.
   3. Fiberglass pipe hangers.
   4. Metal framing systems.
   5. Thermal-hanger shield inserts.
   6. Fastener systems.
   7. Pipe stands.
   8. Equipment supports.

B. Related Sections:
   1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
   2. Section 230516 "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
   3. Section 233113 "Metal Ducts for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
   1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
   2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
1.5 INFORMATIONAL SUBMITTALS
A. Welding certificates.

1.6 QUALITY ASSURANCE
A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS
A. Carbon-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
   3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
   4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
B. Copper Pipe Hangers:
   1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.

2.2 TRAPEZE PIPE HANGERS
A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS
A. MFMA Manufacturer Metal Framing Systems:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.
      c. Flex-Strut Inc.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut Corporation; Tyco International, Ltd.
2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
8. Paint Coating: Vinyl <Insert paint type>.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Anvil International; a subsidiary of Mueller Water Products Inc.
   b. Empire Industries, Inc.
   c. ERICO International Corporation.
   d. Haydon Corporation; H-Strut Division.
   e. PHD Manufacturing, Inc.
   f. PHS Industries, Inc.
   g. <Insert manufacturer's name>.

2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carpenter & Paterson, Inc.
3. ERICO International Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig (688-kPa) minimum compressive strength.
D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
   2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
   1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
   2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:
1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:
1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.


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 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 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:
1. Attach clamps and spacers to piping.
   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) 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 (DN 100) 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 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
   b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.

5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).
3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

F. Use padded hangers for piping that is subject to scratching.

G. Use thermal-hanger shield inserts for insulated piping and tubing.

H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).

2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.

3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.

4. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.

5. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8 (DN 20 to DN 200).

6. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).

7. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).

8. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).

9. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).
10. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).
11. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
12. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
13. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 (DN 65 to DN 900) if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
14. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
15. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.

J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) 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 (49 to 232 deg C) piping installations.

K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-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 (340 kg).
   b. Medium (MSS Type 32): 1500 lb (680 kg).
   c. Heavy (MSS Type 33): 3000 lb (1360 kg).

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.

L. 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.

M. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
   2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
   3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
   4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
   5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
   6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
   7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
   8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
      a. Horizontal (MSS Type 54): Mounted horizontally.
      b. Vertical (MSS Type 55): Mounted vertically.
      c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
O. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

P. Use powder-actuated fasteners instead of building attachments where required in concrete construction.

END OF SECTION 230529
SECTION 230553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes:
   1. Equipment labels.
   2. Warning signs and labels.
   3. Pipe labels.
   4. Duct labels.
   5. Stencils.
   6. Valve tags.
   7. Warning tags.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.
B. Samples: For color, letter style, and graphic representation required for each identification material and device.
C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
D. Valve numbering scheme.
E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION
A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
B. Coordinate installation of identifying devices with locations of access panels and doors.
C. Install identifying devices before installing acoustical ceilings and similar concealment.
PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:
   1. Material and Thickness: Brass, 0.032-inch (0.8-mm) 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 (64 by 19 mm).
   3. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
   5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch (1.6 mm) thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.
2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

   1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

   2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch (1.6 mm) thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

H. 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 (38 mm) high.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers.

   1. Tag Material: Brass, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.

   2. Fasteners: Brass.
B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches (75 by 133 mm) minimum Approximately 4 by 7 inches (100 by 178 mm).
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."

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 branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
2. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
3. At access doors, manholes, and similar access points that permit view of concealed piping.
4. Near major equipment items and other points of origination and termination.
5. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.

a. Background Color: Yellow.

3.4  DUCT LABEL INSTALLATION

A. Install plastic-laminated duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For VRV supply ducts.
2. Yellow: For DOAS supply ducts.
4. ASME A13.1 Colors and Designs: For hazardous material exhaust.

B. Stenciled Duct Label Option: Stenciled labels, showing service and flow direction, may be provided instead of plastic-laminated duct labels, at Installer's option, if lettering larger than 1 inch (25 mm) high is needed for proper identification because of distance from normal location of required identification.

C. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet (15 m) 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.

   a. Gas: 2 inches (50 mm), round.

2. Valve-Tag Color:
   a. Gas: Natural.

3.6  WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 230553
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Heating hot-water piping, indoors.

B. Related Sections:

1. Section 230713 "Duct Insulation."
2. Section 230716 "HVAC Equipment Insulation."
3. Section 232113.13 "Underground Hydronic Piping" for loose-fill pipe insulation in underground piping outside the building.

1.3 ACTION SUBMITTALS

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

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
   a) Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
2. Product Data: For adhesives, indicating VOC content.
   a) Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Product Data: For coatings, indicating VOC content.
   a) Laboratory Test Reports: For coatings, indicating compliance with requirements for low-emitting materials.
4. Product Data: For sealants, indicating VOC content.
   a) Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
5. Product Data: For adhesives, indicating VOC content.
6. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

D. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use.
   1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2.
   2. Sheet Form Insulation Materials: 12 inches square.
   5. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.
B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS


B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Aeroflex USA, Inc.
   b. K-Flex USA.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSP jacket. 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. CertainTeed Corporation.
      b. Johns Manville; a Berkshire Hathaway company.
c. Knauf Insulation.
d. Manson Insulation Inc.
e. Owens Corning.

H. 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.

3. Type II, 1200 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "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. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Childers Brand; H. B. Fuller Construction Products.
   b. Eagle Bridges - Marathon Industries.
   c. Foster Brand; H. B. Fuller Construction Products.
   d. Mon-Eco Industries, Inc.

2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

B. 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. Foster Brand; H. B. Fuller Construction Products.
b. Knauf Insulation.
c. 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.

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. Adhesives shall have a VOC content of 50 g/L or less.
3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
4. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
5. Service Temperature Range: 0 to plus 180 deg F.

2.5 SEALANTS
A. Cellular-Glass, Phenolic, and Polyisocyanurate Joint Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Childers Brand; H. B. Fuller Construction Products.
   b. Eagle Bridges - Marathon Industries.
   c. Foster Brand; H. B. Fuller Construction Products.
   d. Mon-Eco Industries, Inc.
   e. Pittsburgh Corning Corporation.

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.

2.6 SECUREMENTS

A. Bands:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. ITW Insulation Systems; Illinois Tool Works, Inc.
      b. RPR Products, Inc.
   2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015 inch thick, 3/4 inch wide with wing seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: 0.080-inch nickel-copper alloy.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:

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.
   3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
   1. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
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 2 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.
   5. Handholes.
   6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
   4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install
insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.

4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistant joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.

2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, 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 CELLULAR-GLASS INSULATION

A. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.

2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

B. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.

2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:
   1. Install pipe insulation to outer diameter of pipe flange.
   2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
   4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:
   1. Install mitered sections of pipe insulation.
   2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:
   1. Install preformed valve covers manufactured of same material as pipe insulation when available.
   2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   3. Install insulation to flanges as specified for flange insulation application.
   4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 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.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the “Piping Insulation Schedule, General” Article.

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

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.
SECTION 230923.11

CONTROL VALVES

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 control valves and actuators for DDC systems.

1.3 DEFINITIONS

A. Cv: Design valve coefficient.
B. DDC: Direct-digital control.
C. NBR: Nitrile butadiene rubber.
D. PTFE: Polytetrafluoroethylene
E. RMS: Root-mean-square value of alternating voltage, which is the square root of the mean value of the square of the voltage values during a complete cycle.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:
   1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
   4. Installation, operation, and maintenance instructions, including factors affecting performance.
B. Shop Drawings:
   1. Include plans, elevations, sections, and mounting details.
2. Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.
4. Include diagrams for pneumatic signal and main air tubing.

C. Delegated-Design Submittal:

1. Schedule and design calculations for control valves and actuators, including the following:
   a. Flow at project design and minimum flow conditions.
   b. Pressure differential drop across valve at project design flow condition.
   c. Maximum system pressure differential drop (pump close-off pressure) across valve at project minimum flow condition.
   d. Design and minimum control valve coefficient with corresponding valve position.
   e. Maximum close-off pressure.
   f. Leakage flow at maximum system pressure differential.
   g. Torque required at worst case condition for sizing actuator.
   h. Actuator selection indicating torque provided.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plan drawings and corresponding product installation 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. Control valve installation location shown in relationship to room, duct, pipe, and equipment.
   2. Size and location of wall access panels for control valves installed behind walls.
   3. Size and location of ceiling access panels for control valves installed above inaccessible ceilings.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For control valves to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASME Compliance: Fabricate and label products to comply with ASME Boiler and Pressure Vessel Code where required by authorities having jurisdiction.

C. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to size products where indicated as delegated design.
D. Ground Fault: Products shall not fail due to ground fault condition when suitably grounded.

E. Backup Power Source: Systems and equipment served by a backup power source shall have associated control valve actuators served from a backup power source.

F. Determine control valve sizes and flow coefficients by ISA 75.01.01.

G. Control valve characteristics and rangeability shall comply with ISA 75.11.01.

H. Selection Criteria:
   1. Control valves shall be suitable for operation at following conditions:
      a. Heating Hot Water: 125 psig and 190 deg F.
   2. Control valve shutoff classifications shall be FCI 70-2, Class IV or better unless otherwise indicated.
   3. Valve pattern, three-way or straight through, shall be as indicated on Drawings.
   4. Modulating straight-through pattern control valves shall have equal percentage flow-throttling characteristics unless otherwise indicated.
   5. Modulating three-way pattern water valves shall have linear flow-throttling characteristics. The total flow through the valve shall remain constant regardless of the valve’s position.
   6. Modulating butterfly valves shall have equal percentage flow-throttling characteristics.
   7. Fail positions unless otherwise indicated:
      a. Heating Hot Water: Open.
   8. Globe-type control valves shall pass the design flow required with not more than 95 percent of stem lift unless otherwise indicated.
   9. Selection shall consider viscosity, flashing, and cavitation corrections.
   10. Valves shall have stable operation throughout full range of operation, from design to minimum Cv.
   11. Minimum Cv shall be calculated at 10 percent of design flow, with a coincident pressure differential equal to the system design pump head.
   12. In water systems, select modulating control valves at terminal equipment for a design Cv based on a pressure drop of 5 psig at design flow unless otherwise indicated.
   13. Modulating valve sizes for steam service shall provide a pressure drop at design flow equal to lesser of the following:
      a. 50 percent of the valve inlet pressure.
      b. 50 percent of the absolute steam pressure at the valve inlet.
   14. Two-position control valves shall be line size unless otherwise indicated.
   15. In water systems, use ball-style control valve for two-position control for valves NPS 2 and smaller and butterfly style for valves larger than NPS 2.

2.2 BALL-STYLE CONTROL VALVES

A. Ball Valves with Single Port and Characterized Disk:
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. Belimo Aircontrols (USA), Inc.
2. Pressure Rating for NPS 1 and Smaller: Nominal 600 WOG.
3. Pressure Rating for NPS 1-1/2 through NPS 2: Nominal 400 WOG.
5. Process Temperature Range: Zero to 212 deg F.
7. End Connections: Threaded (NPT) ends.
8. Ball: Chrome-plated brass or bronze.
9. Stem and Stem Extension:
   a. Material to match ball.
   b. Blowout-proof design.
   c. Sleeve or other approved means to allow valve to be opened and closed without damaging the insulation or the vapor barrier seal.
10. Ball Seats: Reinforced PTFE.
11. Stem Seal: Reinforced PTFE packing ring with a threaded packing ring follower to retain the packing ring under design pressure with the linkage removed. Alternative means, such as EPDM O-rings, are acceptable if an equivalent cycle endurance can be demonstrated by testing.

B. Ball Valves with Two Ports and Characterized Disk:

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. Belimo Aircontrols (USA), Inc.
2. Pressure Rating for NPS 1 and Smaller: Nominal 600 WOG.
3. Pressure Rating for NPS 1-1/2 through NPS 2: Nominal 400 WOG.
5. Process Temperature Range: Zero to 212 deg F.
7. End Connections: Threaded (NPT) ends.
8. Ball: Chrome-plated brass or bronze or 300 series stainless steel.
9. Stem and Stem Extension:
   a. Material to match ball.
   b. Blowout-proof design.
   c. Sleeve or other approved means to allow valve to be opened and closed without damaging the insulation or the vapor barrier seal.
10. Ball Seats: Reinforced PTFE.
11. Stem Seal: Reinforced PTFE packing ring with a threaded packing ring follower to retain the packing ring under design pressure with the linkage removed. Alternative means, such as EPDM O-rings, are acceptable if an equivalent cycle endurance can be demonstrated by testing.
13. Flow Characteristics for B-Port: Modified for constant common port flow.

C. Ball Valves with Segmented Ball, Three-Way Pattern:
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. Valve Solutions, Inc.

2. Arrangement: Two single-port valves mated to a fabricated tee with interconnecting mechanical linkage.

3. Performance:
   a. Process Temperature Rating: Minus 20 to plus 450 deg F.
   b. ASME B16.34, Class 150.
   c. Leakage: FCI 70-2, Class IV.
   d. Rangeability: 300 to 1.
   e. Rotation: Zero to 90 degrees.
   f. Equal percentage flow characteristic.

5. Valves NPS 3 through NPS 6: Flanged ends suitable for mating to ASME B16.5 flanges.
8. Shaft and Segmented Ball: Pinned and welded.
11. Replaceable seat, ball, and shaft packing.
12. Label each valve with following:
   a. Manufacturer's name, model number, and serial number.
   b. Body size.
   c. Flow directional arrow.

D. Two-Way Globe Valves NPS 2 and Smaller:

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. Johnson Controls, Inc.

4. End Connections: Threaded.
5. Bonnet: Screwed.
7. Plug: Top guided.
9. Process Temperature Range: 35 to 248 deg F.
10. Ambient Operating Temperature: 35 to 150 deg F.
11. Leakage: FCI 70-2, Class IV.
2.3 ELECTRIC AND ELECTRONIC CONTROL VALVE ACTUATORS

A. Actuators for Hydronic Control Valves: Capable of closing valve against system pump shutoff head.

B. Position indicator and graduated scale on each actuator.

C. Type: Motor operated, with or without gears, electric and electronic.

D. Voltage: Voltage selection delegated to professional designing control system.

E. Deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.

F. Function properly within a range of 85 to 120 percent of nameplate voltage.

G. Construction:
   1. For Actuators Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.
   2. For Actuators from 100 to 400 W: Gears ground steel, oil immersed, shaft hardened steel running in bronze, copper alloy or ball bearings. Operator and gear trains shall be totally enclosed in dustproof cast-iron, cast-steel or cast-aluminum housing.
   3. For Actuators Larger Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.

H. Field Adjustment:
   1. Spring Return Actuators: Easily switchable from fail open to fail closed in the field without replacement.
   2. Gear Type Actuators: External manual adjustment mechanism to allow manual positioning when the actuator is not powered.

I. Two-Position Actuators: Single direction, spring return or reversing type.

J. Valve Attachment:
   1. Unless otherwise required for valve interface, provide an actuator designed to be directly coupled to valve shaft without the need for connecting linkages.
   2. Attach actuator to valve drive shaft in a way that ensures maximum transfer of power and torque without slippage.
   3. Bolt and set screw method of attachment is acceptable only if provided with at least two points of attachment.

K. Temperature and Humidity:
   1. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg F.
   2. Humidity: Suitable for humidity range encountered by application; minimum operating range shall be from 5 to 95 percent relative humidity, non-condensing.

L. Enclosure:
   1. Suitable for ambient conditions encountered by application.
   2. NEMA 250, Type 2 for indoor and protected applications.
3. NEMA 250, Type 4 or Type 4X for outdoor and unprotected applications.
4. Provide actuator enclosure with heater and control where required by application.

M. Stroke Time:
   1. Operate valve from fully closed to fully open within 60 seconds.
   2. Move valve to failed position within 30 seconds.
   3. Select operating speed to be compatible with equipment and system operation.

N. Sound:
   1. Spring Return: 62 dBA.
   2. Non-Spring Return: 45 dBA.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   B. Examine roughing-in for valves installed in piping to verify actual locations of piping connections before installation.
   C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.
   D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONTROL VALVE APPLICATIONS
   A. Control Valves:
      1. Select from valves specified in "Control Valves" Article to achieve performance requirements and characteristics indicated while subjected to full range of system operation encountered.

3.3 INSTALLATION, GENERAL
   A. Furnish and install products required to satisfy most stringent requirements indicated.
   B. Install products level, plumb, parallel, and perpendicular with building construction.
   C. Properly support instruments, tubing, piping, wiring, and conduits to comply with requirements indicated.
   D. Provide ceiling, floor, roof, and wall openings and sleeves required by installation. Before proceeding with drilling, punching, or cutting, check location first for concealed products that could potentially be damaged. Patch, flash, grout, seal, and refinish openings to match adjacent condition.
E. Firestop penetrations made in fire-rated assemblies and seal penetrations made in acoustically rated assemblies.

F. Fastening Hardware:
   1. Stillson wrenches, pliers, and other tools that will cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for assembling and tightening nuts.
   2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
   3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.

G. Install products in locations that are accessible and that will permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

H. Corrosive Environments:
   1. When conduit is in contact with a corrosive environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment.
   2. Where control devices are located in a corrosive environment and are not corrosive resistant from manufacturer, field install products in a NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.4 ELECTRIC POWER

A. Furnish and install electrical power to products requiring electrical connections.

B. Furnish and install circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers."

C. Furnish and install power wiring. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

D. Furnish and install raceways. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

3.5 CONTROL VALVES

A. Install pipe reducers for valves smaller than line size. Position reducers as close to valve as possible but at distance to avoid interference and impact to performance. Install with manufacturer-recommended clearance.

B. Install flanges or unions to allow drop-in and -out valve installation.

C. Where indicated, install control valve with three-valve bypass manifold to allow for control valve isolation and removal without interrupting system flow by providing manual throttling valve in bypass pipe.
   1. See drawings.

D. Install drain valves in piping upstream and downstream of each control valve installed in a three-valve manifold and for each control valve larger than NPS 2.
E. Install pressure temperature taps in piping upstream and downstream of each control valve larger than NPS 3/4.

F. Valve Orientation:
   1. Where possible, install globe and ball valves installed in horizontal piping with stems upright and not more than 15 degrees off of vertical, not inverted.
   2. Install valves in a position to allow full stem movement.
   3. Where possible, install butterfly valves that are installed in horizontal piping with stems in horizontal position and with low point of disc opening with direction of flow.

G. Clearance:
   1. Locate valves for easy access and provide separate support of valves that cannot be handled by service personnel without hoisting mechanism.
   2. Install valves with at least 12 inches of clear space around valve and between valves and adjacent surfaces.

H. Threaded Valves:
   1. Note internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.
   2. Align threads at point of assembly.
   3. Apply thread compound to external pipe threads, except where dry seal threading is specified.
   4. Assemble joint, wrench tight. Apply wrench on valve end as pipe is being threaded.

3.6 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 “Identification for Electrical Systems.”

B. Install engraved phenolic nameplate with valve identification on valve and on face of ceiling directly below valves concealed above ceilings.

3.7 CLEANING

A. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from exposed interior and exterior surfaces.

B. Wash and shine glazing.

C. Polish glossy surfaces to a clean shine.

3.8 CHECKOUT PROCEDURES

A. Control Valve Checkout:
   1. Check installed products before continuity tests, leak tests, and calibration.
   2. Check valves for proper location and accessibility.
3. Check valves for proper installation for direction of flow, elevation, orientation, insertion depth, or other applicable considerations that will impact performance.
4. For pneumatic products, verify air supply for each product is properly installed.
5. For pneumatic valves, verify that pressure gauges are provided in each air line to valve actuator and positioner.
6. Verify that control valves are installed correctly for flow direction.
7. Verify that valve body attachment is properly secured and sealed.
8. Verify that valve actuator and linkage attachment are secure.
9. Verify that actuator wiring is complete, enclosed, and connected to correct power source.
10. Verify that valve ball, disc, and plug travel are unobstructed.
11. After piping systems have been tested and put into service, but before insulating and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks. Replace the valve if leaks persist.

3.9 ADJUSTMENT, CALIBRATION, AND TESTING

A. Stroke and adjust control valves following manufacturer's recommended procedure, from 100 percent open to 100 percent closed back to 100 percent open.

B. Stroke control valves with pilot positioners. Adjust valve and positioner following manufacturer's recommended procedure, so valve is 100 percent closed, 50 percent closed, and 100 percent open at proper air pressures.

C. Check and document open and close cycle times for applications with a cycle time of less than 30 seconds.

D. For control valves equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

END OF SECTION 230923.11
SECTION 232113
HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes pipe and fitting materials and joining methods for the following:
   1. Copper tube and fittings.
   2. Steel pipe and fittings.
   4. Transition fittings.
   5. Dielectric fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following:
   1. Plastic pipe and fittings with solvent cement.
   2. Pressure-seal fittings.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Piping layout, 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. Other building services.
   3. Structural members.

B. Qualification Data: For Installer.

C. Welding certificates.

D. Field quality-control reports.

E. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
1. Installers of Pressure-Sealed Joints: Installers shall be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

B. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
   2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 COPPER PIPE AND FITTINGS
   A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.
   B. Copper
   C. Copper, Mechanically Formed Tee Option: For forming T-branch on copper water tube.
      1. Manufacturers: Subject to compliance with requirements, provide products by the following:
         a. T-DRILL Industries Inc.
   D. Wrought-Copper Unions: ASME B16.22.

2.3 STEEL PIPE AND FITTINGS
   A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.
   B. Steel Pressure-Seal Fittings:
      1. Housing: Steel.
      2. O-Rings and Pipe Stop: EPDM.
      3. Tools: Manufacturer's special tool.
      4. Minimum 300-psig working-pressure rating at 230 deg F.
   C. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.
2.4 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.
      a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux according to ASTM B813.

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

E. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

F. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. A.Y. McDonald Mfg. Co.
      b. Capitol Manufacturing Company.
      c. Central Plastics Company.
      d. HART Industrial Unions, LLC.
      e. Jomar Valve.
      f. Matco-Norca.
      g. Watts; a Watts Water Technologies company.
      h. Wilkins.
      i. Zum Industries, LLC.

   2. Description:
      b. Pressure Rating: 150 psig.
      c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Central Plastics Company.
   c. Matco-Norca.
   d. Watts; a Watts Water Technologies company.
   e. Wilkins.
   f. Zurn Industries, LLC.

2. Description:
   b. Factory-fabricated, bolted, companion-flange assembly.
   c. Pressure Rating: 150 psig.
   d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Central Plastics Company.
   d. Pipeline Seal and Insulator, Inc.

2. Description:
   a. Nonconducting materials for field assembly of companion flanges.
   b. Pressure Rating: 150 psig.
   c. Gasket: Neoprene or phenolic.
   d. Bolt Sleeves: Phenolic or polyethylene.
   e. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Elster Perfection Corporation.
   b. Grinnell Mechanical Products.
   c. Matco-Norca.
   d. Precision Plumbing Products.
   e. Victaulic Company.

2. Description:
   b. Electroplated steel nipple, complying with ASTM F 1545.
   c. Pressure Rating: 300 psig at 225 deg F.
   d. End Connections: Male threaded or grooved.
   e. Lining: Inert and noncorrosive, propylene.
PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
2. Schedule 40 steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; and threaded joints.

B. Hot-water heating piping, aboveground, NPS 2-1/2 (DN 65) and larger, shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
2. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.

C. Air-Vent Piping:

1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.
2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.

D. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.

3.2 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.
H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using mechanically formed tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install valves according to Section 230523.11 "Globe Valves for HVAC Piping," Section 230523.12 "Ball Valves for HVAC Piping,"," Section 230523.14 "Check Valves for HVAC Piping," and Section 230523.15 "Gate Valves for HVAC Piping."

Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

R. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

S. Install shutoff valve immediately upstream of each dielectric fitting.

T. Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.

U. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.4 HANGERS AND SUPPORTS

A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.

B. Comply with requirements in Section 230548 "Vibration and Seismic Controls for HVAC" for seismic restraints.

C. Install the following pipe attachments:
   1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
   2. Spring hangers to support vertical runs.
   3. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
   4. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
   1. NPS 3/4: Maximum span, 7 feet.
   2. NPS 1: Maximum span, 7 feet.
   3. NPS 1-1/2: Maximum span, 9 feet.
   4. NPS 2: Maximum span, 10 feet.
   5. NPS 2-1/2: Maximum span, 11 feet.
   6. NPS 3 and Larger: Maximum span, 12 feet.

E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
   1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
   2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
   3. NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
   4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
   5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
   6. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
   7. NPS 3 and Larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.

3.5 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. 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.
D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.

E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

H. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.

I. Pressure-Sealed Joints: Use manufacturer-recommended tool and procedure. Leave insertion marks on pipe after assembly.

3.6 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION 232113
SECTION 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. Double-wall round ducts and fittings.
   4. Sealants and gaskets.
   5. Hangers and supports.

B. Related Sections:
   1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
   2. Section 233119 "HVAC Casings" for factory- and field-fabricated casings for mechanical equipment.
   3. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. 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 "Guidelines for Mechanical Systems."

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following products:
   1. Liners and adhesives.
   2. Sealants and gaskets.
B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
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.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.
5. Design Calculations: Calculations, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation for selecting hangers and supports.

1.5 INFORMATIONAL SUBMITTALS

A. 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. Perimeter moldings.

B. Welding certificates.

C. Field quality-control reports.
1.6 QUALITY ASSURANCE


B. Welding Qualifications: Qualify procedures and personnel according to the following:


C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

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

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Lindab Inc.
b. McGill AirFlow LLC.

c. SEMCO Incorporated.
d. Sheet Metal Connectors, Inc.
e. Spiral Manufacturing Co., Inc.

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).

C. Transverse Joints: Select joint types and fabricate according to SMACNA’s "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA’s "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA’s "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA’s "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.

E. Tees and Laterals: Select types and fabricate according to SMACNA’s "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA’s "HVAC Duct Construction Standards - Metal and Flexible."

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: G60 for indoor applications and G90 for outdoor applications.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Stainless Steel: 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.

D. Factory- or Shop-Applied Antimicrobial Coating:

1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.
2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested according to ASTM D 3363.
4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
5. Shop-Applied Coating Color: [Black] [White].
6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.

E. 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.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:
   1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
   2. Tape Width: 3 inches.
   5. Mold and mildew resistant.
   6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
   7. Service: Indoor and outdoor.
   8. Service Temperature: Minus 40 to plus 200 deg F.
   9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
   10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Water-Based Joint and Seam Sealant:
   1. Application Method: Brush on.
   2. Solids Content: Minimum 65 percent.
   5. Mold and mildew resistant.
   6. VOC: Maximum 75 g/L (less water).
   7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
   8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

2. Type: S.
3. Grade: NS.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

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. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

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 Section 233300 "Air Duct Accessories" for fire and smoke dampers.


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 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD EXHAUST DUCT

A. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.

B. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 12 feet (3.7 m) in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings. Locate access panel on top or sides of duct a minimum of 1-1/2 inches (38 mm) from bottom of duct.

C. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

3.4 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."

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.
E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA’s "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Duct System Cleanliness Tests:
   1. Visually inspect duct system to ensure that no visible contaminants are present.
   2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

      a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

C. Duct system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.8 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

   1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
   2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
   3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

   1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.9 START UP

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

3.10 DUCT SCHEDULE

A. Supply Ducts:

1. Ducts Connected to DOAS, RTU and MAU units:
   a. Pressure Class: Positive 2-inch wg.
   b. Minimum SMACNA Seal Class: A
   c. SMACNA Leakage Class for Rectangular: 6.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

B. Return Ducts:

1. Ducts Connected to Equipment Not Listed Above:
   a. Pressure Class: Positive or negative 2-inch wg.
   b. Minimum SMACNA Seal Class: A.
   c. SMACNA Leakage Class for Rectangular: 6.
   d. SMACNA Leakage Class for Round and Flat Oval: 6.

C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
   a. Pressure Class: Negative 2-inch wg.
   b. Minimum SMACNA Seal Class: C if negative pressure, and A if positive pressure.
   c. SMACNA Leakage Class for Rectangular: 12.
   d. SMACNA Leakage Class for Round and Flat Oval: 6.

2. Ducts Connected to Equipment Not Listed Above:
   a. Pressure Class: Positive or negative 2-inch wg.
   b. Minimum SMACNA Seal Class: C if negative pressure, and A if positive pressure.
   c. SMACNA Leakage Class for Rectangular: 12.
   d. SMACNA Leakage Class for Round and Flat Oval: 6.

D. Intermediate Reinforcement:


E. Liner: see construction documents.

F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
   a. Velocity 1000 fpm or Lower:
      1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
      2) Mitered Type RE 4 without vanes.
   b. Velocity 1000 to 1500 fpm:
      1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
      2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
      3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
   c. Velocity 1500 fpm or Higher:
      1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA’s "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

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

3. Round Duct: Comply with SMACNA’s "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
   a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA’s "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
      1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
      2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
      3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
      4) Radius-to-Diameter Ratio: 1.5.
   b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
   c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

G. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA’s "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
   a. Rectangular Main to Rectangular Branch: 45-degree entry.
   b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA’s "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
   a. Velocity 1000 fpm or Lower: 90-degree tap.
   b. Velocity 1000 to 1500 fpm: Conical tap.
   c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113
SECTION 233300
AIR DUCT ACCESSORIES

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes:
   2. Flange connectors.
   3. Flexible connectors.
   4. Flexible ducts.
B. Related Requirements:
   1. Section 233723 "HVAC Gravity Ventilators" for roof-mounted ventilator caps.
   2. Section 283111 "Digital, Addressable Fire-Alarm System" for duct-mounted fire and smoke detectors.
   3. Section 283112 "Zoned (DC-Loop) Fire-Alarm System" for duct-mounted fire and smoke detectors.

1.3 INFORMATIONAL SUBMITTALS
A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

B. Source quality-control reports.

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

1.5 MAINTENANCE MATERIAL SUBMITTALS
A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fusible Links: Furnish quantity equal to [10] <Insert number> percent of amount installed.
PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION


B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
   2. Exposed-Surface Finish: Mill phosphatized.

B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

C. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
      a. Air Balance Inc.; a division of Mestek, Inc.
      b. American Warming and Ventilating; a division of Mestek, Inc.
      c. Flexmaster U.S.A., Inc.
      d. McGill AirFlow LLC.
      e. Nailor Industries Inc.
      f. Pottorff.
      g. Ruskin Company.
      h. Trox USA Inc.
      i. Vent Products Company, Inc.
   3. Standard leakage rating, with linkage outside airstream.
   4. Suitable for horizontal or vertical applications.
   5. Frames:
      a. Frame: Hat-shaped, 0.094-inch- (2.4-mm-) thick, galvanized sheet steel.
      b. Mitered and welded corners.
      c. Flanges for attaching to walls and flangeless frames for installing in ducts.
6. **Blades:**
   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Galvanized-steel, 0.064 inch (1.62 mm) thick.

7. **Blade Axles:** Galvanized steel.

8. **Bearings:**
   a. Oil-impregnated bronze.
   b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

9. **Tie Bars and Brackets:** Galvanized steel.

**B. Low-Leakage, Steel, Manual Volume Dampers:**

1. **Manufacturers:** Subject to compliance with requirements, provide products by the following:

2. **Basis-of-Design Product:** Subject to compliance with requirements, provide product by one of the following:
   a. Air Balance Inc.; a division of Mestek, Inc.
   b. American Warming and Ventilating; a division of Mestek, Inc.
   c. McGill AirFlow LLC.
   d. Nailor Industries Inc.
   e. Pottorff.
   f. Ruskin Company.
   g. Trox USA Inc.
   h. Vent Products Company, Inc.

3. Comply with AMCA 500-D testing for damper rating.

4. Low-leakage rating, with linkage outside airstream, and bearing AMCA’s Certified Ratings Seal for both air performance and air leakage.

5. Suitable for horizontal or vertical applications.

6. **Frames:**
   a. Hat shaped.
   b. 0.094-inch (2.4-mm) thick, galvanized sheet steel.
   c. Mitered and welded corners.
   d. Flanges for attaching to walls and flangeless frames for installing in ducts.

7. **Blades:**
   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Galvanized, roll-formed steel, 0.064 inch (1.62 mm) thick.

8. **Blade Axles:** Galvanized steel.

9. **Bearings:**
   a. Oil-impregnated bronze.
b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

12. Tie Bars and Brackets: Galvanized steel.
13. Accessories:
   a. Include locking device to hold single-blade dampers in a fixed position without vibration.

C. Jackshaft:
   1. Size: 0.5-inch (13-mm) diameter.
   2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
   3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

D. Damper Hardware:
   1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut.
   2. Include center hole to suit damper operating-rod size.
   3. Include elevated platform for insulated duct mounting.

2.4 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
   1. Ductmate Industries, Inc.
   2. Nexus PDQ; Division of Shilco Holdings Inc.

C. Description: Add-on, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

D. Material: Galvanized steel.

E. Gage and Shape: Match connecting ductwork.

2.5 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
   1. Ductmate Industries, Inc.
   2. Duro Dyne Inc.
3. **Elgen Manufacturing.**
4. **METALAIRE, Inc.**
5. **SEMCO Incorporated.**
6. **Ward Industries, Inc.; a division of Hart & Cooley, Inc.**

C. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. **Acoustic Turning Vanes:** Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

D. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

E. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

F. Vane Construction: Double wall.

G. Vane Construction: Single wall for ducts up to 48 inches (1200 mm) wide and double wall for larger dimensions.

### 2.6 REMOTE DAMPER OPERATORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

B. **Basis-of-Design Product:** Subject to compliance with requirements, provide product by one of the following:

1. **Pottorff.**
2. **Ventfabrics, Inc.**
3. **Young Regulator Company.**

C. Description: Cable system designed for remote manual damper adjustment.

D. Tubing: Brass.

E. Cable: Stainless steel.

F. Wall-Box Mounting: Recessed.

G. Wall-Box Cover-Plate Material: Steel.

### 2.7 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

B. **Basis-of-Design Product:** Subject to compliance with requirements, provide product by one of the following:

1. **American Warming and Ventilating; a division of Mestek, Inc.**
2. **Cesco Products; a division of Mestek, Inc.**
3. Ductmate Industries, Inc.
4. Elgen Manufacturing.
5. Flexmaster U.S.A., Inc.
7. McGill AirFlow LLC.
8. Nailor Industries Inc.
10. Ventfabrics, Inc.

C. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA’s "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2 (7-2M), "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:
   a. Double wall, rectangular.
   b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
   c. Vision panel.
   d. Hinges and Latches: 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.
   e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

3. Number of Hinges and Locks:
   a. Access Doors Less Than 12 Inches (300 mm) Square: No hinges and two sash locks.
   b. Access Doors up to 18 Inches (460 mm) Square: Two hinges and two sash locks.
   c. Access Doors up to 24 by 48 Inches (600 by 1200 mm): Three hinges and two compression latches with outside and inside handles.

2.8 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.

C. Labeled according to UL 1978 by an NRTL.

D. Panel and Frame: Minimum thickness 0.0528-inch carbon.

E. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.

F. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.

G. Minimum Pressure Rating: 10-inch wg, positive or negative.
2.9 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Elgen Manufacturing.
4. Ventfabrics, Inc.

C. Materials: Flame-retardant or noncombustible fabrics.

D. Coatings and Adhesives: Comply with UL 181, Class 1.

E. Metal-Edged Connectors: Factory fabricated with a fabric strip [3-1/2 inches (89 mm)] [5-3/4 inches (146 mm)] wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.


1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

G. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd. (810 g/sq. m).
2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp and 440 lbf/inch (77 N/mm) in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F (Minus 45 to plus 121 deg C).

H. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch (6-mm) movement at start and stop.
2.10 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION


B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire and smoke dampers according to UL listing.

H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. At each change in direction and at maximum 50-foot (15-m) spacing.
8. Upstream from turning vanes.
9. Upstream or downstream from duct silencers.
10. Control devices requiring inspection.
11. Elsewhere as indicated.

I. Install access doors with swing against duct static pressure.

J. Access Door Sizes:
   1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
   2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
   3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
   4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).

K. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

L. Install flexible connectors to connect ducts to equipment.

M. For fans developing static pressures of 5-inch wg (1250 Pa) and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

N. Connect terminal units to supply ducts directly. Do not use flexible ducts to change directions.

O. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch (1500-mm) lengths of flexible duct clamped or strapped in place.

P. Connect flexible ducts to metal ducts with draw bands.

Q. Install duct test holes where required for testing and balancing purposes.

R. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch (6-mm) movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Operate dampers to verify full range of movement.
   2. Inspect locations of access doors and verify that purpose of access door can be performed.
   3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
   4. Inspect turning vanes for proper and secure installation.
   5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 233300
SECTION 238233
CONVECTORS

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 hydronic convectors.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include rated capacities, operating characteristics, furnished specialties, and accessories.
B. Shop Drawings:
   1. Include plans, elevations, sections, and details.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include details and dimensions of custom-fabricated enclosures.
   4. Indicate location and size of each field connection.
   5. Indicate location and arrangement of piping valves and specialties.
   6. Indicate location and arrangement of integral controls.
   7. Include enclosure joints, corner pieces, access doors, and other accessories.
C. Samples: For each exposed product and for each color and texture specified.
D. Color Samples for Initial Selection: For units with factory-applied color finishes.
E. Color Samples for Verification: For each type of exposed finish.

1.4 INFORMATIONAL SUBMITTALS
A. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Structural members, including wall construction, to which convectors will be attached.
   2. Method of attaching convectors to building structure.
   3. Penetrations of fire-rated wall and floor assemblies.
B. Field quality-control reports.
PART 2 - PRODUCTS

2.1 HOT-WATER CONVECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Engineered Air.
   2. Sterling HVAC Products; a Mestek company.
   3. Trane.

B. Heating Elements: Seamless copper tubing mechanically expanded into evenly spaced aluminum fins and rolled into copper tube with bronze headers with inlet/outlet and air vent; steel side plates and supports. Factory-pressure-test element at minimum 100 psig
   1. Heat Output: See schedule

C. Front and Top Panel: Minimum 0.0528-inch thick steel with exposed corners rounded; removable front panels with tamper-resistant fasteners braced and reinforced for stiffness.

D. Wall-Mounted Back and End Panels: Minimum 0.0428-inch thick steel.

E. Insulation: 1/2-inch thick, fibrous glass on inside of the back of the enclosure.

F. Finish: Baked-enamel finish in manufacturer's standard color as selected by Architect.

G. Access Doors: Factory made, permanently hinged with tamper-resistant fastener, minimum size 6 by 7 integral with enclosure.
   1. Front Inlet Grille: Punched louver; painted to match enclosure.
   2. Front Inlet Grille: Extruded-aluminum linear bar grille; pencil-proof bar spacing.
      b. Anodized finish, color as selected by Architect from manufacturer's standard.
      c. Painted to match enclosure.
   3. Top Outlet Grille: Extruded-aluminum linear bar grille; pencil-proof bar spacing.
      b. Anodized finish, color as selected by Architect from manufacturer's standard colors.
      c. Painted to match enclosure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive convectorS for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for hydronic-piping connections to verify actual locations before installation of convector.

C. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 INSTALLATION

A. Install convectors level and plumb.
B. Install valves within reach of access door provided in enclosure.
C. Install air-seal gasket between wall and recessed flanges or front cover of fully recessed unit.
D. Install piping within pedestals for freestanding units.

3.3 CONNECTIONS

A. Connect hot-water convectors and components to piping according to Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties."
   1. Install shutoff valves on inlet and outlet, and balancing valve on outlet.
B. Install control valves as required by Section 230923.11 "Control Valves."
C. Install piping adjacent to convectors to allow service and maintenance.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Operational Test: After electrical circuitry has been energized, start convectors to confirm proper operation.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
B. Convectors will be considered defective if they do not pass tests and inspections.
C. Prepare test and inspection reports.

END OF SECTION 238233
PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes:
   1. Copper building wire rated 600 V or less.
   2. Metal-clad cable, Type MC, rated 600 V or less (limited Application).
   3. .
   4. Connectors, splices, and terminations rated 600 V and less.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS
A. Qualification Data: For testing agency.
B. Field quality-control reports.

1.5 QUALITY ASSURANCE
A. Testing Agency Qualifications: Member Company of NETA.
   1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE
A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Alpha Wire Company.
2. American Bare Conductor.
4. General Cable Technologies Corporation.
5. Service Wire Co.
7. WESCO.

C. Standards:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

E. Conductor Insulation:
1. Type THHN and Type THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

2.2 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems; a part of Atkore International.
2. Alpha Wire Company.
3. American Bare Conductor.
5. General Cable Technologies Corporation.
7. Southwire Company.
8. WESCO.

C. Standards:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Circuits:

E. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8
for stranded conductors.

F. Ground Conductor: Insulated.

G. Conductor Insulation:

1. Type THHN/THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

H. Retain "Multiconductor Armored Cable" Subparagraph below if use of cable is an option.

2.3 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. 3M Electrical Products.
2. AFC Cable Systems; a part of Atkore International.
4. Ideal Industries, Inc.
5. ILSCO.
6. O-Z/Gedney; a brand of Emerson Industrial Automation.
7. Thomas & Betts Corporation; A Member of the ABB Group.

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

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. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.

C. NFPA 70 restricts use of exposed Type NM cable in some types of construction. See NFPA 70, Article 334, for complete listing of restrictions.

D. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.
3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and conductors feeding the following critical equipment and services for compliance with requirements:

3. Perform each of the following visual and electrical tests:

   a. Inspect exposed sections of conductor and cable for physical damage and correct connection.

   b. Inspect compression-applied connectors for correct cable match and indentation.

   c. Inspect for correct identification.

   d. Inspect cable jacket and condition.

   e. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.

   f. Continuity test on each conductor and cable.

   g. Uniform resistance of parallel conductors.

B. Cables will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports to record the following:

1. Procedures used.

2. Results that comply with requirements.

3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519
PART 1 - GENERAL

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

1.2 SUMMARY
A. Section includes grounding and bonding systems and equipment

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS
A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS
A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION
A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advanced Lightning Technology, Ltd.
2. Burndy; Part of Hubbell Electrical Systems.
3. ERICO International Corporation.
4. Harger Lightning & Grounding.
5. ILSCO.
2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
6. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Lead Content: Less than 300 parts per million.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

E. Cable-to-Cable Connectors: Compression type, copper.

F. Conduit Hubs: Mechanical type, terminal with threaded hub.

G. Straps: Solid copper, copper lugs. Rated for 600 A.

H. Lead Content: Less than 300 parts per million.
PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Metal-clad cable runs.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

C. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections with the assistance of a factory-authorized service representative.

D. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

E. Grounding system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and less: 10 ohms.
2. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).

H. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526
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. Conduit and cable support devices.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. 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.

B. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened Portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
   a. Manufacturers: Subject to compliance with requirements, Provide products by one of the following:
      1) B-line, an Eaton business.
      2) Empire Tool and Manufacturing Co., Inc.
      3) Hilti, Inc.
      4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
      5) MKT Fastening, LLC.
      6) Simpson Strong – Tie Co, Inc.

2. 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.

3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.

4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All steel springhead type.

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 101

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 raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Raceway Support Methods: In addition to methods described in NECA 1, IMC, and RMC may be supported by openings through structure members, according to NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Steel: Spring-tension clamps.
5. To Light Steel: Sheet metal screws.
6. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.
3.3 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" 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
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Metal conduits, tubing, and fittings.
   2. Boxes

1.3 DEFINITIONS

A. IMC: Intermediate metal conduit.
B. RMC: Rigid Metal Conduit.
C. FMC: Flexible Metal Conduit.
D. LFMC: Liquid Tight Flexible Steel Conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.5 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems; a part of Atkore International.
   2. Allied Tube & Conduit; a part of Atkore International.
   3. O-Z/Gedney; a brand of Emerson Industrial Automation.
   4. Republic Conduit.
   5. Wheatland Tube Company.
7. Southwire Company.
8. Western Tube and Conduit Corporation.

B. GRC: Comply with ANSI C80.1 and UL 6.
C. IMC: Comply with ANSI C80.6 and UL 1242.
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. Fittings for EMT:
      a. Material: Steel.
      b. Type: Compression type.
   2. 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 IMC or 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 BOXES
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2. Hoffman; a brand of Pentair Equipment Protection.
   3. Hubbell Incorporated.
   4. O-Z/Gedney; a brand of Emerson Industrial Automation.
   5. EGS/Appleton Electric.
   7. Wiremold / Legrand.
   8. Thomas & Betts Corporation.
   10. Spring City Electrical Manufacturing Company.
   11. Milbank Manufacturing Co.
B. General Requirements for Boxes 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. 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.
F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.  

G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.  

H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.  

I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep4 inches by 2-1/8 inches by 2-1/8 inches deep.  

J. Gang-able boxes are allowed.  

PART 3 - EXECUTION  

3.1 RACEWAY APPLICATION  

A. 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.  
4. Concealed in Ceilings and Interior Walls and Partitions: EMT  
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.  
6. Damp or Wet Locations: GRC.  
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in kitchens and damp or wet locations.  

B. Minimum Raceway Size: 3/4-inch trade size.  

C. Raceway Fittings: Compatible with raceways and suitable for use and location.  
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.  
2. EMT: Compression type.  
3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.  

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 Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Stub-ups to Above Recessed Ceilings:
   1. Use EMT, IMC, or RMC for raceways.
   2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

K. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

L. 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.

M. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

O. 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.

P. Install pull string 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.

Q. 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.

R. 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.

S. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

T. Expansion-Joint Fittings:
1. Install in each run of aboveground RMC and EMT 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. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F change.
   c. 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 of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

U. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC in damp or wet locations not subject to severe physical damage.

V. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.

W. 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.

X. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Y. Locate boxes so that cover or plate will not span different building finishes.

Z. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
3.4  FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5  PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION 260533
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
   2. Sleeve-seal fittings.
   4. Silicone sealants.

B. Related Requirements:
   1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:
   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. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
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: EPDM and or Nitrile (Buna N) rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. HOLDRITE.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.


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.
2. Sealant shall have a VOC content of 50 g/L or less.

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 penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
   a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
   b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.

4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

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.

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
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 raceways, conductors, and warning labels and signs.
2. Labels.
4. Tapes and stencils.
5. Tags.
7. Cable ties.
9. 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 electrical 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: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

B. Comply with NFPA 70.


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.

F. 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.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:
   1. Black letters on an orange field.
   2. Legend: Indicate voltage and system or service type.

B. Color-Coding for Phase and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.
   1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
   2. Colors for 208/120-V Circuits:
      a. Phase A: Black.
      b. Phase B: Red.
      c. Phase C: Blue.
   3. Color for Neutral: White or gray.
   5. Colors for Isolated Grounds: Green with white stripe.

C. Warning Label Colors:
   1. Identify system voltage with black letters on an orange background.

D. Equipment Identification Labels:
   1. Black letters on a white field.

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.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Brady Corporation.
      b. Champion America.
      c. emedco.
      d. Grafoplast Wire Markers.
      e. HellermannTyton.
f. LEM Products Inc.
g. Marking Services, Inc.
h. Panduit Corp.
i. Seton Identification Products.

B. Self-Adhesive: Self—Laminating Polyester Labels: Pre-printed, 3-mil – (0.08-mm) thick flexible label with acrylic pressure-sensitive that provides a clear, weather and chemical-resistant, self-laminating, protective shield over the legend.

C. Write-On Tags: Polyester tag, 0.01 inch (0.25mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
   1. Mark-on Tags: Permanent, weatherproof, black ink marker recommended by tag manufacturer.

2.4 BANDS AND TUBES

A. Snap-around, Color-Coding Bands: Slit, pre-tensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameters sized to suit diameters and that stay in place by gripping action.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Brady Corporation.
      b. Hellermann Tyton.
      c. Marking Services, Inc.
      d. Panduit Corp.

2.5 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

   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. Carlton Industries, LP.
      b. Champion America.
      c. HellermannTyton.
      d. Ideal Industries, Inc.
      e. Marking Services, Inc.
      f. Panduit Corp.

B. Tape and Stencil: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers placed diagonally over orange background and are 12 inches (300 mm) wide. Stop stripes at legends.

   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. HellermannTyton.
      b. LEM Products Inc.
c.  Marking Services, Inc.
d.  Seton Identification Products.

2.  Tape:
   a. Recommended by manufacturer for the method of installation and suitable to
      identify and locate underground electrical and communications utility lines.
   b.  Printing on tape shall be permanent and shall not be damaged by burial
      operations.
   c.  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.

3.  Color and Printing:
   a.  Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and
      ANSI Z535.5.

C.  Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1
    inch (25 mm).

2.6  TAGS

A.  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.

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.  Brady Corporation.
    b.  Carlton Industries, LP.
    c.  emedco.
    d.  Marking Services, Inc.
    e.  Seton Identification Products.

B.  Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch (0.38 mm) thick, color-coded for
    phase and voltage level, with factory screened permanent designations; punched for use with
    self-locking cable tie fastener.

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.  Brady Corporation.
    b.  Carlton Industries, LP.
    c.  emedco.
    d.  GrafoPlast Wire Markers.
    e.  LEM Products Inc.
    f.  Marking Services, Inc.
    g.  Panduit Corp.
    h.  Seton Identification Products.
2.7 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).

PART 3 - EXECUTION

3.1 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. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
   1. Secure tight to surface of conductor, cable, or raceway.

G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

H. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:
   1. "EMERGENCY POWER."
   2. "POWER."

I. 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.

J. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

K. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

L. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
M. Metal Tags:
   1. Place in a location with high visibility and accessibility.
   2. Secure using general-purpose, UV-stabilized cable ties.

N. Baked-Enamel Signs:
   1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
   2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.

O. Metal-Backed Butyrate Signs:
   1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
   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 sign; where two lines of text are required, use labels 2 inches (50 mm) high.

P. Cable Ties: General purpose, for attaching tags, except as listed below:
   1. Outdoors: UV-stabilized nylon.
   2. In Spaces Handling Environmental Air: Plenum rated.

3.2 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 of high visibility. Identify by system and circuit designation.

C. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:
   1. "EMERGENCY POWER."
   2. "POWER."
   3. "Retain "Power-Circuit Conductor Identification, 600 V or Less" Paragraph below if color-coding of power and lighting conductors for phase- or voltage-level identification is required to comply with authorities having jurisdiction or special Project requirements. If retaining, coordinate with Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and revise to indicate extent of color-coding required. For existing buildings, indicate whether requirements apply to both old and new wiring or to new wiring only. Below applies only to phase conductors. Color-coding of grounded and grounding conductors shall be conducted according to NFPA 70. Verify that Owner does not require another color code. Specify that colors for factory-assembled cable, such as MC and AC, match colors listed below.
D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, and handholes, use snap-around labels and/or snap-around color-coding bands to identify the phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

E. Control-Circuit Conductor Termination Identification: For identification at terminations, provide with the conductor designation.

F. Conductors to Be Extended in the Future (if any): Attach write-on tags to conductors and list source.

G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.

1. Apply to exterior of door, cover, or other access.

H. Operating Instruction Signs: Self-adhesive labels.

I. Equipment Identification Labels:

1. Indoor Equipment: Self-adhesive label.
2. Equipment to Be Labeled:
   a. Panelboards: Provide new type written directory for the existing panel-boards.
   b. Wiring devices: Provide typewritten label on each wiring device cover plate, indicating panel name and circuit number that is fed from.
   c. Enclosures and electrical junction boxes.
   d. Access doors and panels for concealed electrical items.
   e. Enclosed switches.
   f. Enclosed circuit breakers.
   g. Enclosed controllers.
   h. .

END OF SECTION 260553
PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes:
   1. Standard-grade receptacles, 125 V, 20 A.
   2. GFCI receptacles, 125 V, 20 A.
   3. Toggle switches, 120/277 V, 20 A.
   4. Decorator-style devices, 20 A.
   5. Indoor occupancy sensors
   6. Wall plates.

1.3 DEFINITIONS
A. GFCI: Ground-fault circuit interrupter.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
   1. Show installation details for the following:
      a. Occupancy sensors.
   2. Interconnection diagrams showing field-installed wiring.
   3. Include diagrams for power, signal, and control wiring.
C. Samples: One for each type of device and wall plate specified, in each color specified.

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.

PART 2 - PRODUCTS

2.1 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 use.

B. Comply with NFPA 70.

C. Comply with NEMA WD 1.

D. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
   1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
   2. Devices shall comply with requirements in this Section.

E. Devices for Owner-Furnished Equipment:
   1. Receptacles: Match plug configurations.
   2. Cord and Plug Sets: Match equipment requirements.

F. Device Color:
   1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
   2. Provide all device cover plates with professional quality label to indicate the circuit number and panelboard which is fed from.

G. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STANDARD-GRADE RECEPTACLES, 125 V, 20 A

A. Duplex Receptacles, 125 V, 20 A:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Eaton (Arrow Hart).
      b. Hubbell Incorporated; Wiring Device-Kellems.
2. Description: Two pole, three-wire, and self-grounding.

3. Configuration: NEMA WD 6, Configuration 5-20R.

4. Standards: Comply with UL 498 and FS W-C-596.

2.3 GFCI RECEPTACLES, 125 V, 20 A

A. Duplex GFCI Receptacles, 125 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Eaton (Arrow Hart).
   b. Hubbell Incorporated; Wiring Device-Kellems.
   c. Leviton Manufacturing Co., Inc.
   d. Pass & Seymour/Legrand (Pass & Seymour).

2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.

3. Configuration: NEMA WD 6, Configuration 5-20R.

4. Type: Non-feed through.

5. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.

2.4 TOGGLE SWITCHES, 120/277 V, 20 A

A. Single-Pole Switches, 120/277 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Eaton (Arrow Hart).
   b. Hubbell Incorporated; Wiring Device-Kellems.
   c. Leviton Manufacturing Co., Inc.
   d. Pass & Seymour/Legrand (Pass & Seymour).

2. Standards: Comply with UL 20 and FS W-S-896.

2.5 CEILING MOUNTED OCCUPANCY SENSOR

1. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
   a. Sensitivity Adjustment: Separate for each sensing technology.
   b. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than
12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).

c. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

d. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet (110 square meters).

2.6 WALL PLATES

A. Single Source: Obtain wall plates from same manufacturer of wiring devices.

B. Single and combination types shall match corresponding wiring devices.

   1. Plate-Securing Screws: Metal with head color to match plate finish.
   2. Material for Finished Spaces: Steel with white baked enamel, suitable for field painting.
   4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

   1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes, and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

   1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
   3. The length of free conductors at outlets for devices shall comply with NFPA 70, Article 300, without pigtails.
   4. Existing Conductors:

      a. Cut back and pigtail, or replace all damaged conductors.
      b. Straighten conductors that remain and remove corrosion and foreign matter.
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 right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 GFCI RECEPTACLES

3.3 Install non-feed-through GFCI receptacles where protection of downstream receptacles is not required.

3.4 EXAMINATION

A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.

B. Examine ceilings for suitable conditions where lighting control devices will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.5 SENSOR INSTALLATION

A. Comply with NECA 1.
B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

C. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.6 WIRING INSTALLATION

A. Comply with NECA 1.

B. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 3/4 inch (20 mm).

C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.7 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

C. Wiring devices: Provide typewritten label on each wiring device cover plate, indicating panel name and circuit number that is fed from.

3.8 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

C. Perform the following tests and inspections:
   1. Test Instruments: Use instruments that comply with UL 1436.
   2. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

D. Tests for 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.

E. Test straight-blade for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz. (115 g).

F. Wiring device will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

END OF SECTION 262726
SECTION 265119
LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes the following types of LED luminaires:
   1. Downlight.
   2. Recessed.
   4. Surface mount, linear.

B. Related Requirements:
   1. Section 262726 "Wiring Devices " for occupancy sensors

1.3 DEFINITIONS

A. CCT: Correlated color temperature.
B. CRI: Color Rendering Index.
C. Fixture: See "Luminaire."
D. IP: International Protection or Ingress Protection Rating.
E. LED: Light-emitting diode.
F. Lumen: Measured output of lamp and luminaire, or both.
G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 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.
a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

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. Samples: If requested, for each luminaire and for each color and texture with standard factory-applied finish.

D. Product Schedule: For luminaires and lamps/light source. Use same designations indicated on Drawings.

1.5 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. Luminaires.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches (300 mm) 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.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Product Certificates: For each type of luminaire.

D. Product Test Reports: For each type of luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

E. Sample warranty.
1.6 CLOSEOUT SUBMITTALS
   A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS
   A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
      1. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
      2. 

1.8 QUALITY ASSURANCE
   A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.77, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
   B. Provide luminaires from a single manufacturer for each luminaire type.
   C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.9 DELIVERY, STORAGE, AND HANDLING
   A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY
   A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
   B. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LIGHTING FIXTURE SCHEDULE
   A. Refer to lighting fixture schedule on sheet E001 for specific fixture types and requirements.

2.2 PERFORMANCE REQUIREMENTS
   A. Ambient Temperature: 41 to 104 deg F (5 to 40 deg C).
      1. Relative Humidity: Zero to 95 percent.
B. Altitude: Sea level to 1000 feet (300 m).

2.3 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. 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 light sources are in place.

1. Label shall include the following light source characteristics:
   a. "USE ONLY" and include specific light source type.
   b. CCT and CRI.

C. Recessed luminaires shall comply with NEMA LE 4.

D. California Title 24 compliant.

2.4 DOWNLIGHT

A. Manufacturer: Refer to lighting fixture schedule on the electrical drawings.

B. Nominal Operating Voltage: 120 V ac. UON.

C. Light source:

1. Minimum lumens shall be as specified on the lighting schedule.
2. Minimum allowable efficacy of 80 lm/W. UON.
3. CRI of 80 UON. CCT of 4000 K. UON.
4. Rated light source life of 50,000 hours to L70.
5. Dimmable from 100 percent to 0 percent of maximum light output.
6. Internal driver.
7. Lens Thickness: At least 0.125-inch (3.175-mm) minimum unless otherwise indicated.

D. Housings:

1. UON, extruded-aluminum housing and heat sink.
2. Finish as specified on the schedule.
4. Integral junction box with conduit fittings.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit replacement of light source without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during replacement of light source and when secured in operating position.

F. Diffusers:

1. Fixed or Adjustable lens and distribution type refer to lighting schedule.
2. Tempered Fresnel glass UNO on the schedule.
3. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
4. Glass: Annealed crystal glass unless otherwise indicated.
5. Lens Thickness: At least 0.125-inch (3.175-mm) minimum unless otherwise indicated.

G. Standards:
1. ENERGY STAR certified.
2. UL Listing: Listed for damp location.
3. Recessed luminaires shall comply with NEMA LE 4.

2.5 STRIP LIGHT.

A. Operating Voltage: 120 V ac. UON.

B. Lamp:
1. Minimum 750 lm. UON.
2. Minimum allowable efficacy of 80 lm/W. UON.
3. CRI of 80, UON. CCT of 4000 K, UON.
4. Rated lamp life of 50,000 hours to L70.
5. Dimmable from 100 percent to 0 percent of maximum light output.
6. Internal driver.
7. Lens Thickness: At least 0.125-inch (3.175-mm) minimum unless otherwise indicated.

C. Housings:
1. Extruded-aluminum, (UON) housing and heat sink.
2. Anodized finish, UON.
3. With integral mounting provisions.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit replacement of luminaire without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during replacement and when secured in operating position.

E. Diffusers and Globes:
1. Tempered Fresnel glass, UON.
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Glass: Annealed crystal glass unless otherwise indicated.
4. Lens Thickness: At least 0.125-inch (3.175-mm) minimum unless otherwise indicated.

F. Standards:
1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.
2.6 SURFACE MOUNT, LINEAR

A. Nominal Operating Voltage: 120 V ac. UON.

B. Light Source:
   1. Minimum 750 lm, UON.
   2. Minimum allowable efficacy of 80 lm/W, UON.
   3. CRI of 80, UON. CCT of 4000 K, UON.
   4. Rated life of 50,000 hours to L70.
   5. Dimmable from 100 percent to 0 percent of maximum light output.
   6. Internal driver.
   7. Lens Thickness: At least 0.125-inch (3.175-mm) minimum unless otherwise indicated.

C. Housings:
   1. Extruded-aluminum, UON. housing and heat sink.
   2. Anodized finish, UON.
   3. With integral mounting provisions.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit replacement of light source without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during replacement of light source and when secured in operating position.

E. Diffusers and Globes:
   1. Tempered Fresnel glass, UON.
   2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
   3. Glass: Annealed crystal glass unless otherwise indicated.
   4. Lens Thickness: At least 0.125-inch (3.175-mm) minimum unless otherwise indicated.

F. Standards:
   1. ENERGY STAR certified.
   2. RoHS compliant.
   3. UL Listing: Listed for damp location.

2.7 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. Steel:
   1. ASTM A 36/A 36M for carbon structural steel.
   2. ASTM A 568/A 568M for sheet steel.
C. Stainless Steel:
   1. Manufacturer's standard grade.
   2. Manufacturer's standard type, ASTM A 240/240 M.

D. Galvanized Steel: ASTM A 653/A 653M.

E. Aluminum: ASTM B 209.

2.8 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.

2.9 LUMINAIRE SUPPORT
A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) 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 (2.68 mm).

D. Rod Hangers: 3/16-inch (5-mm) 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 luminaire installation.

C. 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. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:
   1. Sized and rated for luminaire weight.
   2. Able to maintain luminaire position after cleaning and replacing light source.
   3. Provide support for luminaire without causing deflection of ceiling or wall.
   4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaires:
   1. Secured to outlet box.
   2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
   3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaires:
   1. Attached to structural members in walls, attached to a minimum 20 gauge backing plate attached to wall structural members, or attached using through bolts and backing plates on either side of wall as directed by the architect.
   2. Do not attach luminaires directly to gypsum board.

G. Ceiling-Grid-Mounted Luminaires:
   1. Secure to any required outlet box.
   2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
   3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

H. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

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 light sources 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
CODE ANALYSIS

GOVERNING CODES & STANDARDS

- International Mechanical Code - 2012 Edition
- International Plumbing Code - 2012 Edition
- NFPA Standard 70, National Electrical Code - 2014 Edition
- Portable Fire Extinguishers - 2013 Edition
- NFPA Standard 13, Installation of Sprinkler Systems - 2013 Edition
- NFPA Standard 70, National Electrical Code - 2014 Edition
- NFPA Standard 73, Standard for Electrical Installations - 2019 Edition
- Portable Fire Extinguishers - 2013 Edition
- NFPA Standard 13, Installation of Sprinkler Systems - 2013 Edition
- NFPA Standard 70, National Electrical Code - 2014 Edition
- NFPA Standard 73, Standard for Electrical Installations - 2019 Edition
1. DO NOT START CONSTRUCTION UNTIL ALL REQUIRED PERMIT APPROVALS ARE OBTAINED.

2. VISIT THE SITE PRIOR TO CONSTRUCTION TO VERIFY CONDITIONS RELATING TO CONSTRUCTION. THOROUGHLY EXAMINE AND BE FAMILIAR WITH THE DRAWINGS. DRAWINGS ARE TO BE USED TO SHOW DESIGN INTENT ONLY. PERFORM WORK, SHOWN OR IMPLIED, THAT IS NECESSARY TO CARRY OUT THE INTENT OF THE DRAWINGS AND SPECIFICATIONS OR IS CUSTOMARILY PERFORMED AS IF FULLY AND CORRECTLY SET FORTH AND DESCRIBED IN THE DRAWINGS AND SPECIFICATIONS.

3. NOTIFY THE UNIVERSITY OF ANY DISCREPANCIES, OMISSIONS, OR CONFLICTS IN THE CONSTRUCTION DOCUMENTS.

4. FURNISH AND INSTALL ALL ITEMS SHOWN OR IMPLIED ON THE DRAWINGS UNLESS OTHERWISE NOTED.

5. MAINTAIN THE CONSTRUCTION SITE IN A CLEAN AND ORDERLY MANNER.

6. DIMENSIONS SHOWN ON THE DRAWINGS ARE FROM FINISH FACE OF PARTITION UNLESS OTHERWISE NOTED.

7. INFORMATION CONTAINED IN THESE DRAWINGS IS BASED ON LIMITED FIELD MEASUREMENTS AND MAY REQUIRE ADJUSTMENTS OR MODIFICATIONS TO COMPLY WITH EXISTING CONDITIONS. PROGRESS WHERE CHANGES IN THEIR ARE NECESSARY. QUESTIONS ON THIS DRAWING BE DIRECTED TO THE UNIVERSITY.

8. COORDINATE WORK SCHEDULE THROUGH THE TOWSON PROJECT MANAGER. SCHEDULE WORK TO MINIMIZE DISRUPTION TO EXISTING BEAUTY.

9. PROJECT EXISTING BUILDINGS ELEMENTS NOT INDICATED FOR REMOVAL FROM DEMOLITION AND CONSTRUCTION ACTIVITIES.

10. PROVIDE TEMPORARY BARRIERS AND DUST PROTECTION TO PROTECT PUBLIC AREAS FROM CONSTRUCTION ACTIVITIES.

11. CONTRACTOR SHALL BE RESPONSIBLE TO COORDINATE WITH ALL DISCIPLINES AND ALL VENDORS.

12. PROVIDE TEMPORARY WATER LINES TO PROTECT PUBLIC AREAS FROM CONSTRUCTION ACTIVITIES.

13. CONTRACTOR SHALL BE RESPONSIBLE TO COORDINATE WITH ALL DISCIPLINES AND ALL VENDORS.
**CLEARANCES AT DOORS**

- Front approach, pull side
- Front approach, push side
- Hinge approach, pull side
- Hinge approach, push side
- Latch approach, pull side
- Latch approach, push side
- Side approach

**CLEAR FLOOR SPACE REQUIREMENTS**

- Minimum width: 30" at door open
- Maximum width: 34" maximum

- Knee clearance: 11" minimum
- Vertical clearance: 305 in. at door open
- Horizontal clearance: 2'-0" maximum depth

- Limit of protruding objects: 80" maximum
- Clear width: Any amount

- Front approach, pull side
- Front approach, push side
- Hinge approach, pull side
- Hinge approach, push side
- Latch approach, pull side
- Latch approach, push side
- Side approach

- Minimum width: 36" minimum
- Maximum width: 42" minimum

- Knee clearance: 11" minimum
- Vertical clearance: 305 in. at door open
- Horizontal clearance: 2'-0" maximum depth

- Limit of protruding objects: 80" maximum
- Clear width: Any amount

- 4° minimum

- Minimum width: 32" minimum
- Maximum width: 36" minimum

- Knee clearance: 11" minimum
- Vertical clearance: 305 in. at door open
- Horizontal clearance: 2'-0" maximum depth

- Limit of protruding objects: 80" maximum
- Clear width: Any amount

- 4° minimum

- Minimum width: 24" minimum
- Maximum width: 27" maximum

- Knee clearance: 11" minimum
- Vertical clearance: 305 in. at door open
- Horizontal clearance: 2'-0" maximum depth

- Limit of protruding objects: 80" maximum
- Clear width: Any amount

- 4° minimum

- Minimum width: 24" minimum
- Maximum width: 27" maximum

- Knee clearance: 11" minimum
- Vertical clearance: 305 in. at door open
- Horizontal clearance: 2'-0" maximum depth

- Limit of protruding objects: 80" maximum
- Clear width: Any amount

- 4° minimum

- Minimum width: 24" minimum
- Maximum width: 27" maximum

- Knee clearance: 11" minimum
- Vertical clearance: 305 in. at door open
- Horizontal clearance: 2'-0" maximum depth

- Limit of protruding objects: 80" maximum
- Clear width: Any amount

- 4° minimum
GENERAL DEMOLITION NOTES:

A. REMOVE EXISTING/INTEGRAL STRUCTURAL ELEMENTS WITHIN THE PROJECT SITE EXCEPT WHERE INDICATED BY NOTE OR SYMBOL AS EXISTING TO REMAIN. SEE MEP DRAWINGS FOR EXISTENCE OF MEP DEMOLITION.

B. EXISTING MATERIALS ARE AS FOLLOWS: LWC, GRIND DUST, CEILING TILES, FLOOR FINISHES, CEMENTITE BLDG.

C. DEMOLITION DRAWINGS SHOW GENERAL PRESENCE OF REQUIRED WORK. REMOVE FIXTURES, FANS, LIGHTS, DEVICES, ETC. AS REQUIRED TO PREPARE THE PROJECT SITE TO RECEIVE NEW WORK. SEE NEW WORK DRAWINGS FOR ADDITIONAL INFORMATION.

D. PERFORMANCE OF WORK SHOWN ELSEWHERE IN THIS CONTRACT DOCUMENTS THAT REQUIRED DEMOLITION NOT SHOWN ON DEMOLITION DRAWINGS. SUCH WORK SHALL INCLUDE, BUT IS NOT LIMITED TO THE FOLLOWING:

1. CLOSET SHELVES, CLOSET CUTTING AND REMOVAL OF WLOL AND SLAM AS NECESSARY TO INSTALL MECHANICAL, ELECTRICAL, AND PLUMBING WORK. REFER TO MECH AND PLUMB DRAWINGS TO COORDINATE REQUIRED WORK.

2. PHASE DEMOLITION AND PROVIDE TEMPORARY FACILITIES REQUIRED TO MAINTAIN MECH, ELECTRICAL AND LIFE SAFETY SYSTEMS SERVING OCCUPIED SPACES IN FULL OPERATING CONDITION. COORDINATE PLAN FOR MAINTENANCE OF THESE SYSTEMS WITH PROJECT OFFICER.

E. PHASE DEMOLITION AND PROVIDE TEMPORARY FACILITIES AS REQUIRED TO MAINTAIN MECH, ELECTRICAL AND LIFE SAFETY SYSTEMS SERVING OCCUPIED SPACES IN FULL OPERATING CONDITION. COORDINATE PLAN FOR MAINTENANCE OF THESE SYSTEMS WITH PROJECT OFFICER.

F. LOGICAL REMOVAL OF TELEPHONE, PA SYSTEMS, INTERCOMS, DATA SYSTEMS, ETC. WITH UNIVERSITY PROJECT MANAGER.

G. MAINTENİNG BUILDINGS IN WEATHER TIGHT CONDITION.

H. RESTORE FIRE SEPARATION CONSTRUCTION TO FULL CAPACITY AS SOON AS POSSIBLE AFTER DEMOLITION ACTIVITIES HAVE COMPLETED THEIR INTENT.

I. PROVIDE TEMPORARY BRACING REQUIRED TO SUPPORT BUILDING ELEMENTS TO REMAIN AND REQUIRED TO MAINTAIN THE BUILDING IN A SAFE CONDITION.

J. REMOVE ALL FINISHES REQUIRED TO PREPARE THE BUILDING TO RECEIVE NEW FLOORING, WALL FINISHES, AND CEILING FINISHES. REMOVAL OF FINISHES WHICH RELATE TO SUBSTRATES TO REMAIN FOR NEXT FLOORING, WALL FINISHING, AND CEILING FINISHING.

K. ALL CONSTRUCTION DEBRIS (THIS INCLUDES RECYCLABLE AND NON-RECYCLABLE) ARE TO BE CYCLED THROUGH CONSTRUCTION DEBRIS, BALTIMORE COUNTY'S SCRAP METAL DUMPSTERS.

L. DISPOSE ALL NON-RECYCLABLE ITEMS OFF-SITE UNLESS INDICATED TO BE SALVAGED OR REUSED IN NEW WORK.

M. ALL LOOSE SURFACES AND EQUIPMENT NOT SHOWN TO BE REMOVED SHALL BE TURNED OVER TO TOWSON UNIVERSITY PROJECT OFFICER TO SELL TO THE PUBLIC OR TO REUSE.

N. ALL ITEMS INDICATED WITH A DASHED LINE ARE TO BE REMOVED UNLESS INDICATED TO BE REMOVED LARGER THAN THE LIMIT OF CONSTRUCTION.

O. REMOVE ALL LIGHT FIXTURES, REMOVE ALL WALLMOUNTED TOILET ACCESSORIES.

P. REMOVE ALL LIGHT FIXTURES, REMOVE ALL WALLMOUNTED TOILET ACCESSORIES.

Q. REMOVE AND RECYCLE OR REUSE MATERIALS, EQUIPMENT, AND SURFACES AS SHOWN ON THE COMPLETED PROJECT DRAWINGS AND SUBMISSIONS.

R. PROVIDE EXISTING EXTERIOR CORRIDORS TO BUILDING EXITS SERVING OCCUPIED AREAS OUTSIDE AREA OF CONSTRUCTION.

S. PROVIDE EXISTING SANITARY PIPING DURING DEMOLITION WITH LIMIT OF CONSTRUCTION.

T. ALL REMAINING WALLS ARE TO RECEIVE A NEW LAYER OF ABUSE RESISTANT GYP BOARD. THE ORIGINAL FAINT IS TO BE REMOVED DOWN TO THE STRUCTURE DURING THE DEMOLITION PHASES.

DEMOlITION LEGEND:

1) REMOVE PARTITION

2) REMOVE DOOR, ETC.

3) REMOVE LIGHT FIXTURES,

4) REMOVE PLUMBING FIXTURES, LWC.

5) REMOVE BASEMENT CONCRETE SLAB.

TID) FLOOR/CEILING & EN

A-101S - PARTIAL BASEMENT DEMOLITION PLAN - SCARBOROUGH

DEMOlITION KEY NOTES:

1) REMOVE ALL PLUMBING FIXTURES, REMOVE ALL LINOLEUM TOILET ACCESSORIES.

2) REMOVE EXISTING LIGHT FIXTURES AND SETTING BACK TO STRUCTURAL SLAB.

3) REMOVE WALLBOARD: REMOVE SURFACE FOR INSTALLATION OF NEW CEILING SYSTEMS.

4) REMOVE EXISTING LIGHT FIXTURES THROUGHOUT.

SCARBOROUGH DORMITORY

KEY PLAN

AREA OF WORK

1/8" = 1'-0"
1/17/2019 8:31:36 PM
Toilet Rm Reno_C_2017_V3_YBagheri.rvt
**DEMOLITION KEY NOTES**

- **01** REMOVE ALL PLUMBING FIXTURES. REMOVE ALL WALLMOUNTED TOILET ACCESSORIES.
- **02** REMOVE EXISTING FLOORING AND SETTING BACK TO TOPPING SLAB.
- **03** REMOVE THRESHOLD; PREPARE SURFACE FOR INSTALLATION OF NEW THRESHOLD.
- **04** REMOVE EXISTING LIGHT FIXTURES THROUGHOUT.
- **05** REMOVE EXISTING AIR DIFFUSER. SEE MEP DWGS.
- **06** REMOVE EXISTING BULKHEAD.
- **07** DEMO PORTION OF STRUCTURAL SLAB FOR INSTALLATION OF TRENCH DRAIN. COORDINATE WITH TRENCH DRAIN MANUFACTURER REQUIREMENTS.
- **08** REMOVE EXISTING BASE BOARD HEATER.
- **09** REMOVE INTERIOR LAYER OF GWB/CERAMIC TILE FROM ALL PARTITIONS WITHIN THE TOILET ROOM/SHOWER ROOM. REMOVE ALL WALL MOUNTED TOILET ACCESSORIES.
- **10** REMOVE EXISTING CEILING DIFFUSER, SEE MEP DWGS.
- **11** REMOVE AND SALVAGE ANY REQUIRED WINDOW TRIM TO FACILITATE THE REFINISHING OF THE WALLS.
- **12** INFILL GAP IN TOPPING SLAB CAUSED BY THE REMOVAL OF THE EXISTING PARTITIONS WITH CONCRETE.

**DEMOLITION LEGEND:**

- **X** REMOVE PARTITION
- **X** REMOVE GWB/CERAMIC TILE
- **X** REMOVE INTERIOR LAYER
- **X** REMOVE EXISTING FLOORING AND SETTING BACK TO TOPPING SLAB
- **X** REMOVE THRESHOLD; PREPARE SURFACE FOR INSTALLATION OF NEW THRESHOLD
- **X** REMOVE EXISTING LIGHT FIXTURES THROUGHOUT
- **X** REMOVE EXISTING AIR DIFFUSER. SEE MEP DWGS.
- **X** REMOVE EXISTING BULKHEAD.
- **X** DEMO PORTION OF STRUCTURAL SLAB FOR INSTALLATION OF TRENCH DRAIN. COORDINATE WITH TRENCH DRAIN MANUFACTURER REQUIREMENTS
- **X** REMOVE EXISTING BASE BOARD HEATER
- **X** REMOVE INTERIOR LAYER OF GWB/CERAMIC TILE FROM ALL PARTITIONS WITHIN THE TOILET ROOM/SHOWER ROOM. REMOVE ALL WALL MOUNTED TOILET ACCESSORIES
- **X** REMOVE EXISTING CEILING DIFFUSER, SEE MEP DWGS.
- **X** REMOVE AND SALVAGE ANY REQUIRED WINDOW TRIM TO FACILITATE THE REFINISHING OF THE WALLS
- **X** INFILL GAP IN TOPPING SLAB CAUSED BY THE REMOVAL OF THE EXISTING PARTITIONS WITH CONCRETE

**SCARBOROUGH DORMITORY**

**FIRST FLOOR PARTIAL DEMOLITION PLAN - SCARBOROUGH**

**FIRST FLOOR DEMOLITION RCP - SCARBOROUGH**
DEMOLITION KEY NOTES:

1. DESIGN TO DEMOLITION ACTIVITY BY ROOM
2. REMOVE ALL PLUMBING FIXTURES, REMOVE ALL WALL MOUNTED TOILET ACCESSORIES
3. REMOVE EXISTING FLOORING AND SETTING BACO TO TOPPING SLAB
4. REMOVE THRESHOLD, PREPARING SURFACE FOR INSTALLATION OF NEW THRESHOLD
5. REMOVE EXISTING LIGHT FIXTURES THROUGHOUT
6. REMOVE EXISTING CEILING DIFFUSER, SEE MEP DWGS
7. REMOVE EXISTING AIR DIFFUSER, SEE MECH DWGS
8. REMOVE ALL EXISTING BASE BOARD HEATERS
9. REMOVE INTERIOR LAYER OF GWB/CERAMIC TILE FROM ALL PARTITIONS WITHIN THE TOILET ROOM/SHOWER ROOM. REMOVE ALL WALL MOUNTED TOILET ACCESSORIES
10. REMOVE EXISTING CEILING DIFFUSER, SEE MEP DWGS
11. REMOVE AND SALVAGE ANY REQUIRED WINDOW TRIM TO FACILITATE THE REFINISHING OF THE WALLS
12. INFILL GAP IN TOPPING SLAB CAUSED BY THE REMOVAL OF THE EXISTING PARTITIONS WITH CONCRETE

DEMOLITION LEGEND:

- REMOVE PARTITION
- REMOVE DOORS
- REMOVE LIGHT FIXTURES, SEE MEP DWGS
- REMOVE CEILING DIFFUSER, SEE MECH
- REMOVE EXISTING FLOOR DRAIN, CAP PIPES AS REQUIRED, SEE PLUMBING DWGS
- REMOVE EXISTING radiation HEATING PIPES AS REQUIRED, SEE PLUMBING DWGS
- REMOVE EXISTING COUNTER TOP AND MIRROR
- REMOVE EXISTING BULKHEAD
- DEMO PORTION OF STRUCTURAL SLAB FOR INSTALLATION OF TRENCH DRAIN, COORDINATE WITH TRENCH DRAIN MANUFACTURER
- REMOVE EXISTING GWB CLNG
- REMOVE EXISTING FLOOR DRAIN, CAP PIPES AS REQUIRED, SEE PLUMBING DWGS
DEMO KEY NOTES:

01 REMOVE ALL PLUMBING FIXTURES, REMOVE ALL WALLMOUNTED TOILET
ACCESSORIES.
02 REMOVE EXISTING FLOORING AND SETTING BACK TO TOPPING SLAB
03 REMOVE EXISTING RELICURS FOR INSTALLATION OF NEW
WALLMOUNT.
04 REMOVE EXISTING LIGHT FIXTURES THROUGHOUT
05 REMOVE EXISTING BASE BOARDS.
06 REMOVE EXISTING ELECTRICAL FIXTURES THROUGHOUT
07 REMOVE EXISTING LIGHT FIXTURES tile from all partitions
08 REMOVE EXISTING CEILING DIFFUSER, SEE MEP.
09 REMOVE EXISTING BASE BOARD HEATER.
10 REMOVE INTERIOR LAYER OF GWB/CERAMIC TILE FROM ALL
PARTITIONS WITHIN THE TOILET ROOM/SNOWER ROOM. REMOVE ALL WALL MOUNTED
TOILET ACCESSORIES
11 REMOVE EXISTING CEILING DIFFUSER, SEE MEP.
12 REMOVE AND SALVAGE ANY REQUIRED WINDOW TRIM TO FACILITATE THE
REFINISHING OF THE WALLS.
13 INFLIP GAP IN TOPPING SLAB CAUSED BY THE REMOVAL OF THE EXISTING
PARTITIONS WITH CONCRETE.
14 REMOVE EXISTING EXISTING FLOOR DRAIN, CAP PIPE AS REQUIRED, SEE PLUMBING DRAWINGS
LIMIT OF CONSTRUCTION.

DEMOLITION LEGEND:

- REMOVE PARTITION
- PARTITION, ETR
- DOOR, ETR
- REMOVE GWB CLNG
- REMOVE LIGHT FIXTURES, SEE ELEC
- FLOOR DRAIN, ETR
- EXISTING AIR DIFFUSER, SEE MECH
- PIPES, ETR
- EXISTING FASTENERS, SEE STRUCT.
- REMOVE EXISTING FASTENERS, SEE STRUCT.
- REMOVE EXISTING FASTENERS, AS SHOWN, SEE PLUMBING DRAWINGS

DRAWING TITLE:

THIRD FLOOR DEMOLITION RCP - SCARBOROUGH

DIMENSIONS:

1/8" = 1'-0"

KEY PLAN:

SCARBOROUGH DORMITORY

AREA OF WORK

1/17/19 8:31:40 PM

rchitect: LOUVIERE, STRATTON & YOKEL, LLC

EChanical Engineer: COMPREHENSIVE STRUCTURAL SOLUTIONS, LLC

Structural Engineer: LOUVIERE, STRATTON & YOKEL, LLC

Global Engineering Solutions: GLOBAL ENGINEERING SOLUTIONS

Constr. Cons.: LOUVIERE, STRATTON & YOKEL, LLC


1/8" = 1'-0"
DEMO Key Notes:

1. DESIGNATE DEMOLITION ACTIVITY BY ROOM
2. REMOVE ALL PLUMBING FIXTURES, REMOVE ALL WALLMOUNTED TOILET ACCESSORIES.
3. REMOVE EXISTING FLOORING AND SETTING BACK TO TOPPING SLAB.
4. REMOVE EXISTING LIGHT FIXTURES THROUGHOUT.
5. REMOVE INTERIOR LAYER OF CERAMIC TILE FROM ALL PARTITIONS WITHIN THE TOILET ROOM/SHOWER ROOM. REMOVE ALL WALL MOUNTED TOILET ACCESSORIES.
6. REMOVE EXISTING CEILING DIFFUSER, SEE MEP DWGS.
7. REMOVE AND SALVAGE ANY REQUIRED WINDOW TRIM TO FACILITATE THE REFINISHING OF THE WALLS.
8. INFILL GAP IN TOPPING SLAB CAUSED BY THE REMOVAL OF THE EXISTING PARTITIONS WITH CONCRETE.

Demolition Key Legend:

- REMOVE PARTITION
- REMOVE GWB CLNG
- REMOVE LIGHT FIXTURES, SEE ELEC
- REMOVE EXISTING FLOOR DRAIN, CAP PIPES AS REQUIRED, SEE PLUMBING DRAWINGS LIMIT OF CONSTRUCTION

First Floor Demolition RCP - Prettyman

First Floor Demolition Plan - Prettyman
DEMOLITION KEY NOTES:

1. REMOVE ALL PLUMBING FIXTURES. REMOVE ALL WALLMOUNTED TOILET ACCESSORIES.

2. REMOVE EXISTING COVERINGS AND SETTING BACK TO TOPPING SLAB.

3. REMOVE THRESHOLD. PREPARE SURFACE FOR INSTALLATION OF NEW THRESHOLD.

4. REMOVE LIGHT FIXTURES THROUGHOUT.

5. REMOVE EXISTING COVERER TOP AND MIRROR.

6. REMOVE EXISTING BASEBOARDS.

7. REMOVE EXISTING BULKHEAD.

8. REMOVE EXISTING CHARRED HEATER.

9. REMOVE AND SALVAGE ANY REQUIRED WINDOW TRIM TO FACILITATE THE REFINISHING OF THE WALLS.

10. REMOVE EXISTING CEILING DIFFUSER, SEE MEP DWGS.

11. REMOVE INTERIOR LAYER OF GWB/CERAMIC TILE FROM ALL PARTITIONS WITHIN THE TOILET ROOM/SHOWER ROOM. REMOVE ALL WALL MOUNTED TOILET ACCESSORIES.

12. REMOVE EXISTING BASE BOARD HEATER.

13. REMOVE INTERIOR LAYER OF GWB/CERAMIC TILE FROM ALL PARTITIONS WITHIN THE TOILET ROOM/SHOWER ROOM. REMOVE ALL WALL MOUNTED TOILET ACCESSORIES.

14. REMOVE EXISTING CEILING DIFFUSER, SEE MEP DWGS.

15. REMOVE AND SALVAGE ANY REQUIRED WINDOW TRIM TO FACILITATE THE REFINISHING OF THE WALLS.

16. INFILL GAP IN TOPPING SLAB CAUSED BY THE REMOVAL OF THE EXISTING PARTITIONS WITH CONCRETE.

17. REMOVE EXISTING FLOOR DRAIN. CAP FIPSE AD REQUIRED. SEE PLUMBING DRAWINGS.

18. REMOVE EXISTING FLOOR DRAIN. CAP FIPSE AS REQUIRED. SEE PLUMBING DRAWINGS.

19. LIMIT OF CONSTRUCTION.
1. REMOVE ALL PLUMBING FIXTURES. REMOVE ALL WALL MOUNTED TOILET ACCESSORIES.
2. REMOVE EXISTING FLOORS AND SetTings BACK TO TOPPING SLAB.
3. REMOVE EXISTING CEILING BOARDS. REMOVE EXISTING CEILING SURFACES FOR INSTALLATION OF NEW SURFACES.
4. REMOVE EXISTING LIGHT FIXTURES THROUGHOUT.
5. REMOVE EXISTING CEILING POP TIP AND MIRROR.
6. REMOVE EXISTING BATH FIXTURES.
7. REMOVE EXISTING SINK. REMOVE EXISTING RECESSED LIGHTING FOR REPLACEMENT OF TRENCH DRAIN, COORDINATE WITH TRENCH DRAIN MANUFACTURER.
8. REMOVE EXISTING BATH BOARDS.
9. REMOVE INTERIOR LAYER OF INSULATION (WALLS) FROM ALL PARTITIONS.
10. REMOVE ALL WALL MOUNTED TOILET ACCESSORIES.
11. REMOVE EXISTING CEILING DIFFUSER. SEE MEP DWGS.
12. REMOVE AND SALVAGE ANY REQUIRED WINDOW TRIM TO FACILITATE THE REFINISHING OF THE WALLS.
13. REMOVE EXISTING CEILING DIFFUSER, SEE MECH.
14. DEMO PORTION OF STRUCTURAL SLAB FOR INSTALLATION OF TRENCH DRAIN.
15. REMOVE EXISTING BASE BOARD HEATER.
16. REMOVE INTERIOR LAYER OF GWB/CERAMIC TILE FROM ALL PARTITIONS WITHIN THE TOILET ROOM/SHOWER ROOM. REMOVE ALL WALL MOUNTED TOILET ACCESSORIES.
17. REMOVE EXISTING CEILING DIFFUSER, SEE MECH.
18. REMOVE AND SALVAGE ANY REQUIRED WINDOW TRIM TO FACILITATE THE REFINISHING OF THE WALL.
19. REMOVE EXISTING CEILING DIFFUSER, SEE MECH.
20. REMOVE EXISTING CEILING DIFFUSER. REMOVE EXISTING LIGHT FIXTURES.

DEMOLITION LEGEND:
- REMOVE PARTITION
- REMOVE CEILING
- REMOVE LIGHT FIXTURES, SEE MECH.
- EXISTING AIR DIFFUSER, SEE MECH.
- REMOVE EXISTING FLOOR DRAIN, CAP PIPES AS REQUIRED; SEE PLUMBING DRAWINGS.
- REMOVE EXISTING FLOOR DRAIN, CAP PIPES AS REQUIRED; SEE PLUMBING DRAWINGS.
- LIMIT OF CONSTRUCTION

DEMOlITION KEY NOTES:
(A) TYPICAL
- DESIGNATE DEMOLITION ACTIVITY BY ROOM

THIRD FLOOR DEMOLITION RCP - PRETTYMAN

THIRD FLOOR PARTIAL DEMOLITION PLAN - PRETTYMAN
TOILET ACCESSORY SCHEDULE

<table>
<thead>
<tr>
<th>MARK</th>
<th>EQUIPMENT</th>
<th>TYPE</th>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>MOUNTING LOCATION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TA-1</td>
<td>TOILET TISSUE DISPENSER</td>
<td>TORK</td>
<td>56TR (SMOKE)</td>
<td>WALL SURFACE MOUNTED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TA-2</td>
<td>MIRROR</td>
<td>BOBRICK</td>
<td>B-165</td>
<td>WALL SURFACE MOUNTED</td>
<td>TA-3</td>
<td>WASTE RECEPTACLE</td>
</tr>
<tr>
<td>TA-4</td>
<td>SANITARY NAPKIN DISPOSAL</td>
<td>BOBRICK</td>
<td>B-5270</td>
<td>WALL SURFACE MOUNTED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TA-6</td>
<td>LED BACKLIT MIRROR</td>
<td>BOBRICK</td>
<td>B-167</td>
<td>WALL</td>
<td>TA-8</td>
<td>36&quot; GRAB BAR</td>
</tr>
<tr>
<td>TA-7</td>
<td>42&quot; GRAB BAR</td>
<td>BOBRICK</td>
<td>B-5806 X 18 WALL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TA-9</td>
<td>18&quot; GRAB BAR</td>
<td>BOBRICK</td>
<td>B-5806 X 18 WALL</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
GENERAL NEW WORK NOTES:

A. Dimensions shown are to the face of GWB partition unless indicated otherwise.

B. All new partitions are D05 unless noted otherwise.

C. Remove existing GWB where GWB pipes are to be installed in the walls (refer to Figure 8. See MEP drawings for pump locations in existing walls). Rotted GWB wall and repaired.

D. Field verify all room dimensions prior to final shop drawing completion. Any conflicts to be reported to the Project Officer for resolution.

E. All existing walls are to receive a new layer of moisture resistant drywall. The original finish is to be removed down to the structural surface during the demolition phase.

KEY NOTES:

1. Designate new work activity by

2. Work down 1/2 per ft. typ. on all modesty module showers.

3. High points sloped floor typ.

4. Showerhead and faucet matl. typ.

5. Modesty module shower typ.

6. Trench drain, see plumbing and structural drawings.

7. Showerhead, see plumbing and structural drawings

8. Limit of construction

NEW WORK LEGEND:

- Partition, ETR
- Door, ETR
- New Partition
- Modesty Module
- Showerhead, TYP
- Trench drain, see plumbing and structural drawings
- Showerhead, see plumbing and structural drawings
- Limit of construction

KEY PLAN:

SCARBOROUGH DORMITORY

AREA OF WORK

BASEMENT NEW WORK FLOOR PLAN - SCARBOROUGH

PARTIAL FIRST FLOOR NEW WORK PLANS-SCARBOROUGH
1. SLOPE DOWN 1/4" PER FT. TYP. IN ALL MODESTY MODULE SHOWERS.
2. HIGH POINT INSULATED FLOOR TYP.
3. SHAVER HEAD TYP.
4. PREDICTED LAYER OF GORB/CERAMIC TILES ON THE BAT DRAINAGE; INTER 
   MINERAL OF EXISTING TILES/TOILET/SHOWER FLOOR IS REMOVED 
   THROUGHOUT PROJECT AREA U. N. O.
5. EXTEND PORTION OF TOILET/SHOWER STALL INTO WINDOW. ATTACH 
   PORTION OF STALL TO WINDOW SILL WITH 6"X6" CLIP BRACKETS.
6. EXTEND EXISTING DUCTWORK TO BE IN LINE WITH THE NEW FURRING 
   PARTITION. INSTALL NEW GRILL.

NEW WORK LEGEND:

- **PARTITION, ETR**
- **DOOR, ETR**
- **NEW PARTITION**
- **MODESTY MODULE**
- **SHOWERS TYP.**
- **TRENCH DRAIN, SEE PLUMBING**
- **LIMIT OF CONSTRUCTION**

KEY NOTES (TYPICAL):

- DESIGNATE NEW WORK ACTIVITY BY ROOM.

**NEW WORK PLAN**

**AREA OF WORK**

**PRETTYMAN DORMITORY**

**KEY PLAN**
PARTIAL THIRD FLOOR NEW WORK PLAN - PRETTYMAN

KEY NOTES:

1. SLOPE DOWN 1/4" PER FT. TYP. IN ALL MODESTY MODULE SHOWERS.
2. SHOWERS TYP.
3. MODESTY MODULE TYP.
4. INSTALLATION OF TRENCH DRAIN TO CONNECT TO TOILET PIPING AND SHOWER PIPING THROUGH OUT PROJECT AREA TYP.
5. EXTEND PORTION OF TOILET/SHOWER STALL INTO WINDOW. ATTACH PORTION OF STALL TO WINDOW SILL WITH 6"X6" CLIP BRACKETS.
6. EXTEND EXISTING DUCTWORK TO BE IN LINE WITH THE NEW FURRING PARTITION. INSTALL NEW GRILL.

NEW WORK LEGEND:

- PARTITION, ETR
- DOOR, ETR
- NEW PARTITION
- MODESTY MODULE, ETR
- TRENCH DRAIN, SEE PLUMBING AND STRUCTURAL DRAWINGS
- LIMIT OF CONSTRUCTION

KEY PLAN
31. FIRST FLOOR NEW WORK REFLECTED CEILING PLAN - SCARBOROUGH

41. BASEMENT NEW WORK REFLECTED CEILING PLAN - SCARBOROUGH

KEY NOTES:

(TYPICAL                   )

X

DESIGNATE NEW WORK ACTIVITY BY
ROOM

(1) ALIBRANDI COLD RINSE/FAUCETwickens Joint
UNISEX
RESTROOM
107S

24
A-501
TYP

9"
8"
2' - 0"
9 1/2"
1' - 5 1/2"
2' - 0"
7"
9"
3' - 0"
1' - 6 1/2"
3' - 6 1/2"
3' - 0"
9' - 3"

A.F.F.
7' - 6"

RCP LEGEND:

1/4" = 1'-0"

A-121S

FIRST FLOOR NEW WORK REFLECTED CEILING PLAN - SCARBOROUGH

AREA OF WORK

SCARBOROUGH DORMITORY

KEY PLAN
SECOND FLOOR NEW WORK REFLECTED CEILING PLAN - SCARBOROUGH

KEY PLAN

AREA OF WORK

SCARBOROUGH DORMITORY
Third Floor New Work Reflected Ceiling Plan - Scarborough

Key Notes:
1. Designate new work activity by room.
2. Align coffered light with width of toilet partition stalls below.

RCP Legend:
- DWG CLNG "LIGHT FIXTURES"
- CMB CLNG "COVE LIGHT"

Cove light, refer to standard detail.

Area of Work

Scarborough Dormitory

Key Plan
GENERAL FINISH NOTES:

A. FINISH IS TO BE SEMI-GLOSS THROUGHOUT
B. ALL EXISTING DOORS AND FRAMES ARE TO BE PAINTED
C. ALL SLABS ARE TO RECEIVE ARDEX SELF LEVELING COMPOUND PRIOR TO LAYING FLOOR TILE.
D. FLOORS ARE TO BE FINISHED AS SHOWN WITH ARDEX
E. ALL CERAMIC TILE OUTSIDE CORNERS ARE TO RECEIVE 1 1/2" JOINTS
F. ALL CERAMIC TILE TRANSITION FROM WALL TO FLOOR USE 1/8" JOINTS
G. ALL CERAMIC TILE ANGLES TO CEILING TRANSITION SHOULD BE 1/2" RADIUS
H. CEILING TILE AND GRID IS TO BE 4'-0" THROUGHOUT
J. ALL PAINT IS TO BE PT-1, UNO
K. ALL WALLS THAT ARE TO RECEIVE TILE ARE TO RECEIVE 5/8" CEMENT BOARD IN LIEU OF 5/8" GYP BOARD.

KEY NOTES:

- NOTE 1: SECTION OF WALL TO RECEIVE FIELD TILE CT-1 FLOOR TO CEILING WITH CT-3 ACCENT AS SHOWN ON ELEVATIONS
- NOTE 2: SECTION OF WALL TO RECEIVE FIELD TILE CT-1 FLOOR TO CEILING WITH CT-2 ACCENT AS SHOWN ON ELEVATIONS
- NOTE 3: SECTION OF WALL TO RECEIVE FIELD TILE CT-1 FLOOR TO CEILING WITH CT-1 ACCENT AS SHOWN ON ELEVATIONS
- NOTE 4: WALL TO BE PAINTED PT-3
- NOTE 5: WALL TO BE PAINTED PT-3..
GENERAL FINISH NOTES:

A. PAINT FINISH IS TO BE SEMI-GLOSS THROUGHOUT
B. ALL EXISTING DOORS AND FRAME ARE TO BE PAINTED
C. ALL SLABS ARE TO RECEIVE ARDEX SELF-LEVELING COMPOUND PRIOR TO LAYING FLOOR TILE.
D. FLOORS ARE TO BE SLOPED AS SHOWN WITH ARDEX
E. ALL CERAMIC TILEOUTER CORNERS ARE TO RECEIVE 1/2" X 2-1/2" TILE TRIM.
F. ALL CERAMIC TILE TRANSITION FROM WALL TO FLOOR TILE IS TO USE 1/2" X 1" TRANSITION
G. ALL CERAMIC TILE ANGLES TO CEILING TRANSITION SHOULD BE 1/2" X 2-1/2" H. CEILING TILE AND GRID IS TO BE 4 X 4" THROUGHOUT I. ALL WALLS THAT ARE TO RECEIVE TILE ARE TO RECEIVE 5/8" CEMENT BOARD IN LIEU OF 5/8" GYP BOARD.

NOTE 1: EXISTING DOOR AND FRAME TO BE PAINTED PT
NOTE 2: SECTION OF WALL TO RECEIVE FIELD TILE CT-1 FLOOR TO CEILING WITH CT-3 ACCENT AS SHOWN ON ELEVATIONS
NOTE 3: SECTION OF WALL TO RECEIVE FIELD TILE CT-1 FLOOR TO CEILING WITH CT-2 ACCENT AS SHOWN ON ELEVATIONS
NOTE 4: WALL TO BE PAINTED PT

KEY NOTES:

A. PAINT FINISH IS TO BE SEMI-GLOSS THROUGHOUT
B. ALL EXISTING DOORS AND FRAME ARE TO BE PAINTED
C. ALL SLABS ARE TO RECEIVE ARDEX SELF-LEVELING COMPOUND PRIOR TO LAYING FLOOR TILE.
D. FLOORS ARE TO BE SLOPED AS SHOWN WITH ARDEX
E. ALL CERAMIC TILEOUTER CORNERS ARE TO RECEIVE 1/2" X 2-1/2" TILE TRIM.
F. ALL CERAMIC TILE TRANSITION FROM WALL TO FLOOR TILE IS TO USE 1/2" X 1" TRANSITION
G. ALL CERAMIC TILE ANGLES TO CEILING TRANSITION SHOULD BE 1/2" X 2-1/2" H. CEILING TILE AND GRID IS TO BE 4 X 4" THROUGHOUT I. ALL WALLS THAT ARE TO RECEIVE TILE ARE TO RECEIVE 5/8" CEMENT BOARD IN LIEU OF 5/8" GYP BOARD.

NOTE 1: EXISTING DOOR AND FRAME TO BE PAINTED PT
NOTE 2: SECTION OF WALL TO RECEIVE FIELD TILE CT-1 FLOOR TO CEILING WITH CT-3 ACCENT AS SHOWN ON ELEVATIONS
NOTE 3: SECTION OF WALL TO RECEIVE FIELD TILE CT-1 FLOOR TO CEILING WITH CT-2 ACCENT AS SHOWN ON ELEVATIONS
NOTE 4: WALL TO BE PAINTED PT

KEY PLAN:

SCARBOROUGH DORMITORY

PARTIAL SECOND FLOOR NEW WORK FINISH PLANS - SCARBOROUGH

PARTIAL THIRD FLOOR NEW WORK FINISH PLAN - SCARBOROUGH
GENERAL FINISH NOTES:

A. PAINT FINISH IS TO BE SEMI-GLOSS THROUGHOUT
B. ALL EXISTING DOOR AND FRAME ARE TO BE PAINTED
C. ALL SLAB ARE TO RECEIVE ARDEX SELF LEVELING COMPOUND PRIOR TO LAYING FLOOR TILE
D. FLOOR ARE TO BE LINED AS SHOWN WITH ARDEX
E. ALL CARTON TILE OUTSIDE CORNER ARE TO RECEIVE CT-
F. ALL CERAMIC TILE TRANSITION FROM WALL TO FLOOR IS TO USE CT-
G. ALL CERAMIC TILE WALLS TO CEILING TRANSITION SHOULD BE CT-
H. CEILING TILE AND GRID IS TO BE AT CT-
I. ALL PAINTS AND TO RECEIVE TILE ARE TO RECEIVE 5/8" CEMENT BOARD RUSSEL OF CT-

KEY NOTES:

NOTE 1: SECTION OF WALL TO RECEIVE FIELD TILE CT-
NOTE 2: SECTION OF WALL TO RECEIVE FIELD TILE CT-
NOTE 3: SECTION OF WALL TO RECEIVE FIELD TILE CT-
NOTE 4: SECTION OF WALL TO RECEIVE FIELD TILE CT-
NOTE 5: SECTION OF WALL TO RECEIVE FIELD TILE CT-
NOTE 6: SECTION OF WALL TO RECEIVE FIELD TILE CT-
NOTE 7: SECTION OF WALL TO RECEIVE FIELD TILE CT-
NOTE 8: SECTION OF WALL TO RECEIVE FIELD TILE CT-

KEY PLAN

BASEMENT NEW WORK FINISH FLOOR PLAN - PRETTYMAN

PARTIAL FIRST FLOOR NEW WORK FINISH PLANS-PRETTYMAN

WOMEN'S RESTROOM

UNISEX RESTROOM

TOILET ROOM / SHOWER ROOM
GENERAL FINISH NOTES:

A. PAINT FINISH IS TO BE SEMI-GLOSS THROUGHOUT
B. ALL EXISTING DOORS AND FRAMES ARE TO BE PAINTED
C. ALL SLABS ARE TO RECEIVE ARDEX SELF-LEVELING COMPOUND PRIOR TO LAYING FLOOR TILES.
D. FLOORS ARE TO BE SLOPED AS SHOWN WITH ARDEX.
E. ALL CERAMIC TILES OUTSIDE CORNERS ARE TO RECEIVE 3/4" RADIUS BULLNOSE EDGES.
F. FLOOR TO CEILING TILES ARE TO REACH 1'-0" TO 1'-6" HIGH.
G. ALL CERAMIC WALL TILES SHOULD BE 12" X 12".
H. CEILINGS ARE TO BE 9' HIGH.
I. ALL PAINT IS TO BE PT-1, UNO.
J. ALL WALLS THAT ARE TO RECEIVE TILE ARE TO RECEIVE 5/8" CEMENT BOARD IN LIEU OF 5/8" GYP BOARD.

KEY NOTES:

NOTE 1: EXISTING DOOR, FRAMES TO BE PAINTED PT-1.
NOTE 2: SECTION OF WALL TO RECEIVE FIELD TILE CT-1 FLOR TO CEILING WITH CT-2 ACCENT AS SHOWN ON ELEVATIONS.
NOTE 3: SECTION OF WALL TO RECEIVE FIELD TILE CT-1 FLOR TO CEILING WITH CT-3 ACCENT AS SHOWN ON ELEVATIONS.
NOTE 4: SECTION OF WALL TO RECEIVE FIELD TILE CT-1 FLOR TO CEILING WITH CT-2 ACCENT AS SHOWN ON ELEVATIONS.
NOTE 5: ALL WALL TO BE PAINTED PT-2.
NOTE 6: ALL WALLS THAT ARE TO RECEIVE TILE ARE TO RECEIVE 5/8" CEMENT BOARD IN LIEU OF 5/8" GYP BOARD.
**FOR FINISHES, REFER TO FINISH PLANS.**
WOMEN RESTROOM 006P - EAST ELEVATION

UNISEX RESTROOM 106P - EAST

UNISEX RESTROOM 107P - WEST

TOILET ROOM/SHOWER ROOM 305P - WEST ELEV.
TOILET PARTITION

GYP BOARD SOFFIT

ALUMINUM TRANSITION

ALUMINUM TRANSITION

GYP BOARD

CT-2

SOFFIT

CT-1

CT-3

SOLID SURFACE COUNTERTOP

1' - 0"

CT-2

TOILET PARTITION

BACKLIT MIRROR

SOAP DISPENSER

ALUMINUM TRANSITION

CT-1

CT-3

ALUMINUM TRANSITION

ALUMINUM COVE

CT-1

CT-2

TOILET PARTITION

BACKLIT MIRROR

SOAP DISPENSER

ALUMINUM TRANSITION

CT-1

CT-2

TOILET PARTITION

BACKLIT MIRROR

SOAP DISPENSER

ALUMINUM TRANSITION

CT-1

CT-2

TOILET PARTITION

BACKLIT MIRROR

SOAP DISPENSER

ALUMINUM TRANSITION

CT-1

CT-2

TOILET PARTITION

BACKLIT MIRROR

SOAP DISPENSER

ALUMINUM TRANSITION

CT-1

CT-2

TOILET PARTITION

BACKLIT MIRROR

SOAP DISPENSER

ALUMINUM TRANSITION

CT-1

CT-2

TOILET PARTITION

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SOAP DISPENSER

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TOILET PARTITION

BACKLIT MIRROR

SOAP DISPENSER

ALUMINUM TRANSITION

CT-1

CT-2

TOILET PARTITION

BACKLIT MIRROR

SOAP DISPENSER

ALUMINUM TRANSITION

CT-1

CT-2

TOILET PARTITION

BACKLIT MIRROR

SOAP DISPENSER

ALUMINUM TRANSITION

CT-1

CT-2
1 1/2" STEEL STUD
5/8" CEMENT BOARD
WATER PROOFING MEMBRANE
SETTING BED
TILE
TRENCH DRAIN, REFER TO PLUMBING DRAWINGS

EXISTING PARTITION WITH EXISTING SURFACE REMOVED AND STUD EXPOSED
5/8" CEMENT BOARD
WATER PROOFING MEMBRANE
SETTING BED
TILE
TRENCH DRAIN, REFER TO PLUMBING DRAWINGS

EXISTING BEAM

2 1/2" METAL STUD
5/8" CEMENT BOARD
WATER PROOFING MEMBRANE
SETTING BED
TILE
TRENCH DRAIN, REFER TO PLUMBING DRAWINGS

EXISTING PARTITION WITH EXISTING SURFACE REMOVED AND STUD EXPOSED
5/8" CEMENT BOARD
WATER PROOFING MEMBRANE
SETTING BED
TILE
TRENCH DRAIN, REFER TO PLUMBING DRAWINGS

EXISTING BEAM

6" = 1'-0"
3" = 1'-0"
3" = 1'-0"
### WALL SCHEDULE

<table>
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<tr>
<th>Wall Tag</th>
<th>Stud/Furring</th>
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<th>Sound Attenuation</th>
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<tr>
<td>D05</td>
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**NOTE 1**: Brace Furring Studs Against Substrate Wall Where Height Exceeds Manufacturer’s Limitation For Furring Studs.

**NOTE 2**: Substitute 5/8" GWB For 5/8" Cement Board Where Walls Are Scheduled To Receive Tile.

### FINISH SCHEDULE

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<thead>
<tr>
<th>Finish</th>
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<th>A/E Task No.</th>
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<td>7008 Alabaster Sherwin Williams Promar 200 Eggshell</td>
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<td>PT-3</td>
<td>7015 Repose Gray Sherwin Williams Promar Industrial</td>
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<tr>
<td>ATC-1</td>
<td>ACOUSTICAL CEILING PANEL</td>
<td>Armstrong</td>
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<td>B-1</td>
<td>CERAMIC TILE</td>
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<td>12X24 ARCHITECTURAL CERAMICS</td>
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### ROOM FINISH SCHEDULE

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### FINISH LEGEND:

- PT-1: Painted Wall 1
- PT-2: Painted Wall 2
- ATC-1: Acoustic Tile Ceiling (Laboratory)
- GB0: Painted Gypsum Board

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**NOTE 1**: BRACE FURRING STUDS AGAINST SUBSTRATE WALL WHERE HEIGHT EXCEEDS MANUFACTURER HEIGHT LIMITATION FOR FURRING STUD.

**NOTE 2**: SUBSTITUTE 5/8" GWB FOR 5/8" CEMENT BOARD WHERE WALLS ARE SCHEDULED TO RECEIVE TILE.
PARTIAL THIRD FLOOR
FRAMING PLAN - FREITZMAN
1/4" = 1'-0"
1. SEE DRAWING MD201 FOR PIPING RISER DIAGRAM FOR PRETTYMAN.
2. SEE DRAWING MD202 FOR PIPING RISER DIAGRAM FOR SCARBOROUGH.
3. CONTRACTOR TO DRAIN HEATING HOT WATER SYSTEM AS NEEDED.

BASEMENT - HVAC - DEMOLITION - PRETTYMAN

1. DEMOLISH EXISTING 3/4" HWS & R RISERS
2. DEMOLISH EXISTING FTR AND ENCLOSURE.
3. EXISTING FTR TO REMAIN
4. EXISTING 1 1/4" HWS UP
5. EXISTING 1" HWS DN
6. EXISTING 3/4" HWR DN TO REMAIN.
7. EXISTING PIPING AT CEILING.
8. DEMOLISH EXISTING 3/4" HWS RISER.
1. SEE DRAWING MD201 FOR PIPING RISER DIAGRAMS FOR PRETTYMAN.
2. SEE DRAWING MD202 FOR PIPING RISER DIAGRAM FOR SCARBOROUGH.
3. CONTRACTOR TO DRAIN HEATING HOT WATER SYSTEM AS NEEDED.
1. SEE DRAWING MD201 FOR PIPING RISER DIAGRAMS FOR PRETTYMAN.

2. SEE DRAWING MD202 FOR PIPING RISER DIAGRAM FOR SCARBOROUGH.

3. CONTRACTOR TO DRAIN HEATING HOT WATER SYSTEM AS NEEDED.
1. SEE DRAWING MD201 FOR PIPING RISER DIAGRAMS FOR PRETTYMAN.
2. SEE DRAWING MD202 FOR PIPING RISER DIAGRAM FOR SCARBOROUGH.
3. CONTRACTOR TO DRAIN HEATING HOT WATER SYSTEM AS NEEDED.

---

**GENERAL NOTES:**
1. SEE DRAWING MD201 FOR PIPING RISER DIAGRAMS FOR PRETTYMAN.
2. SEE DRAWING MD202 FOR PIPING RISER DIAGRAM FOR SCARBOROUGH.
3. CONTRACTOR TO DRAIN HEATING HOT WATER SYSTEM AS NEEDED.

**KEYED NOTES:**

- **FIRST FLOOR - HVAC - DEMOLITION - SCARBOROUGH**

1. EXISTING DUCT RISER TO REMAIN 15"X8" UP 12"X6" DN
2. DEMOLISH EXISTING 12"X12" EXHAUST REGISTER ON WALL
3. DEMOLISH EXISTING CONVECTOR
4. DEMOLISH EXISTING WALL REGISTER
5. EXISTING 10"X10" DUCT RISER TO REMAIN
6. EXISTING 10"X6" CEILING EXHAUST REGISTER TO REMAIN
7. EXISTING 12"X8" DUCT RISER TO REMAIN
8. DEMOLISH EXISTING 12"X8" 220 CFM EXHAUST REGISTER ON WALL
9. DEMOLISH EXISTING CEILING REGISTER
10. EXISTING DUCT TO REMAIN
11. EXISTING 3/4" HWS DN TO REMAIN
12. NEW 3/4" HWS UP TO CONVECTOR ABOVE
13. EXISTING 3/4" HWR UP TO CONVECTOR ABOVE
14. EXISTING 3/4" HWS UP & DN TO REMAIN
15. EXISTING 3/4" HWR DN TO REMAIN
16. EXISTING 3/4" HWR UP TO CONVECTOR ABOVE
17. EXISTING 3/4" HWR UP TO REMAIN
1. SEE DRAWING MD201 FOR PIPING RISER DIAGRAM FOR PRETTYMAN.
2. SEE DRAWING MD202 FOR PIPING RISER DIAGRAM FOR SCARBOROUGH.
3. CONTRACTOR TO DRAIN HEATING HOT WATER SYSTEM AS NEEDED.

GENERAL NOTES:
- SEE DRAWING MD201 FOR PIPING RISER DIAGRAM FOR PRETTYMAN.
- SEE DRAWING MD202 FOR PIPING RISER DIAGRAM FOR SCARBOROUGH.
- CONTRACTOR TO DRAIN HEATING HOT WATER SYSTEM AS NEEDED.

SECOND FLOOR - HVAC - DEMOLITION - PRETTYMAN

1. DEMOLISH EXISTING FTR AND ENCLOSURE.
2. DEMOLISH EXISTING CONVECTOR.
3. EXISTING 24"X7" DUCT RISER TO REMAIN.
4. DEMOLISH EXISTING WALL REGISTER.
5. DEMOLISH EXISTING PIPING BETWEEN FTR AND POINTS OF NEW CONNECTION.
6. EXISTING 1 1/4" HWS DN & 3/4" HWS UP.
7. EXISTING DUCT RISER TO REMAIN 30"X11" UP, 30"X6" DN.
8. DEMOLISH EXISTING 3/4" HWR RISER.
9. DEMOLISH EXISTING 3/4" HWS RISER.
10. EXISTING 3/4" PIPING AT FLOOR TO REMAIN.
11. EXISTING FTR TO REMAIN.
12. EXISTING 3/4" HWR UP & DN TO REMAIN.
1. SEE DRAWING MD201 FOR PIPING RISER DIAGRAMS FOR PRETTYMAN.
2. SEE DRAWING MD202 FOR PIPING RISER DIAGRAM FOR SCARBOROUGH.
3. CONTRACTOR TO DRAIN HEATING HOT WATER SYSTEM AS NEEDED.
1. SEE DRAWING MD201 FOR PIPING RISER DIAGRAMS FOR PRETTYMAN.
2. SEE DRAWING MD202 FOR PIPING RISER DIAGRAM FOR SCARBOROUGH.
3. CONTRACTOR TO DRAIN HEATING HOT WATER SYSTEM AS NEEDED.

GENERAL NOTES:
1. SEE DRAWING MD201 FOR PIPING RISER DIAGRAMS FOR PRETTYMAN.
2. SEE DRAWING MD202 FOR PIPING RISER DIAGRAM FOR SCARBOROUGH.
3. CONTRACTOR TO DRAIN HEATING HOT WATER SYSTEM AS NEEDED.

KEYED NOTES:

THIRD FLOOR - HVAC - DEMOLITION - PRETTYMAN

1. EXISTING DUCT RISER TO REMAIN 28"X10" UP, 24"X7" DN
2. DEMOLISH EXISTING CONVECTOR.
3. DEMOLISH EXISTING 3/4" PIPING DN BELOW THIRD FLOOR.
4. DEMOLISH EXISTING PIPING BETWEEN FTR AND POINTS OF NEW CONNECTION.
5. DEMOLISH EXISTING 3/4" HWS RISER.
6. DEMOLISH EXISTING 3/4" HWR RISER.
7. DEMOLISH EXISTING WALL REGISTER
8. EXISTING 10"X6" CEILING EXHAUST REGISTER TO REMAIN
9. EXISTING DUCT RISER TO REMAIN 35"X14" UP, 30"X11" DN
10. DEMOLISH EXISTING FTR AND ENCLOSURE.
1. SEE DRAWING MD201 FOR PIPING RISER DIAGRAMS FOR PRETTYMAN.
2. SEE DRAWING MD202 FOR PIPING RISER DIAGRAM FOR SCARBOROUGH.
3. CONTRACTOR TO DRAIN HEATING HOT WATER SYSTEM AS NEEDED.
1. SEE DRAWING M201 FOR PIPING RISER DIAGRAMS FOR PRETTYMAN.
2. SEE DRAWING M202 FOR PIPING RISER DIAGRAMS FOR SCARBOROUGH.

BASEMENT - HVAC - NEW WORK - PRETTYMAN

1. NEW WALL CONVECTOR
2. EXISTING FTR TO REMAIN
3. EXISTING HWS RISER TO REMAIN
4. EXISTING HWS DN TO REMAIN
5. CONNECT NEW 3/4" HWS & R TO NEW CONVECTOR
6. NEW 3/4" HWR UP TO CONVECTOR ABOVE
7. NEW 3/4" HWS UP TO CONVECTOR ABOVE
8. NEW 3/4" HWR UP
9. NEW 3/4" HWS UP
10. EXISTING ...
11. NEW 3/4" PIPING AT FLOOR
12. EXISTING 1 1/4" HWS UP
13. EXISTING 3/4" HWS DN
14. NEW 3/4" HWS & R UP TO CONVECTOR ABOVE
BASEMENT - HVAC - NEW WORK - SCARBOROUGH
FIRST FLOOR - HVAC - NEW WORK - SCARBOROUGH

1. SEE DRAWING M201 FOR PIPING RISER DIAGRAMS FOR PRETTYMAN.
2. SEE DRAWING M202 FOR PIPING RISER DIAGRAMS FOR SCARBOROUGH.
SECOND FLOOR - HVAC - NEW WORK - PRETTYMAN
SECOND FLOOR - HVAC - NEW WORK - SCARBOROUGH

1. NEW WALL CONVECTOR
2. EXISTING HWS RISER TO REMAIN
3. NEW 3/4" HWS UP & DN
4. NEW 3/4" HWR UP & DN
5. NEW 3/4" HWR DN
6. NEW 3/4" HWS DN
7. NEW 3/4" HWR UP
8. NEW 10"X6" EXHAUST REGISTER 100 CFM.
9. EXISTING 10"X6" CEILING EXHAUST REGISTER TO REMAIN.
10. EXISTING 10"X6" EXHAUST REGISTER TO REMAIN.
11. EXISTING DUCT RISER TO REMAIN 18"X10" UP, 10"X10" DN
12. EXISTING DUCT RISER TO REMAIN 15"X10" UP, 15"X8" DN
13. NEW 12"X12" EXHAUST REGISTER.
14. NEW 3/4" HWR UP TO CONVECTOR ABOVE
15. NEW 3/4" HWS UP TO CONVECTOR ABOVE
16. EXISTING DUCT RISER TO REMAIN 22"X10" UP, 18"X8" DN
17. NEW 3/4" HWS AT CEILING.
18. NEW 3/4" HWR AT CEILING.
19. EXISTING 3/4" HWR DN TO REMAIN.
20. NEW 18"X12" EXHAUST REGISTER.
THIRD FLOOR - HVAC - NEW WORK - PRETTYMAN

1. SEE DRAWING M201 FOR PIPING RISER DIAGRAMS FOR PRETTYMAN.

2. SEE DRAWING M202 FOR PIPING RISER DIAGRAMS FOR SCARBOROUGH.
GENERAL NOTES:
1. SEE DRAWING M201 FOR PIPING RISER DIAGRAMS FOR PRETTYMAN.
2. SEE DRAWING M202 FOR PIPING RISER DIAGRAMS FOR SCARBOROUGH.

KEYED NOTES:

1. THIRD FLOOR - HVAC - NEW WORK - SCARBOROUGH

- 1 NEW WALL CONVECTOR
- 2 EXISTING DUCT RISER TO REMAIN 22"X10" UP, 18"X12" DN
- 3 NEW 18"X12" EXHAUST REGISTER
- 4 NEW 10"X6" EXHAUST REGISTER 100 CFM
- 5 EXISTING 10"X6" EXHAUST REGISTER TO REMAIN
- 6 EXISTING DUCT RISER TO REMAIN 15"X10" UP & DN
- 7 NEW 12"X12" EXHAUST REGISTER
**CONVECTOR SCHEDULE**

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<th>LENGTH (INCH)</th>
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<th>TOTAL (BTU/HR)</th>
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**DIFFUSER, REGISTER & GRILLE SCHEDULE**

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**REMARKS:**
1. Coordinate color and finish with architect.
2. Coordinate shading and type air devices with architectural ceiling plans. Provide all necessary accessories to achieve full compatibility with ceiling type.
3. Coordinate air devices with architectural ceiling plans. Provide all necessary accessories to achieve full compatibility with ceiling type.
4. Provide frames type as required per installation.
PLUMBING GENERAL CONDITIONS

1. All plans and specifications are subject to change without notice. Owners, contractors, and subcontractors shall be responsible for ensuring that all equipment and materials conform to the required specifications and standards.

2. Contractor shall coordinate with the electrical contractor to verify that all equipment are installed in accordance with the electrical drawings.

3. Contractor shall acknowledge acceptance of these plans as an adequate definition of the scope of work and extra costs claims based on any changes or modifications.

4. Contractor shall coordinate with the building automation system to ensure proper integration of the plumbing system.

5. Contractor shall provide openings in building construction for passage of piping. Do not penetrate structural members without prior approval of the architect.

6. Contractor shall install all equipment in accordance with the manufacturer’s recommendations.

7. Contractor shall verify that all equipment, piping, etc., shall be free from interference with other disciplines. Where conflicts occur, the contractor shall coordinate with the appropriate parties to resolve.

8. Contractor shall be responsible for determining the exact locations for equipment and rough-ins and the exact routing of piping prior to construction as to best fit the architectural drawings.

9. All work to be guaranteed for one year against labor and materials. Any defective materials or workmanship, as well as damage to the building, shall be repaired or replaced at the contractor’s expense.

10. All concrete floors, slabs, brick and block wall penetrations shall be sleeved and fire protected.

11. The contractor shall notify the engineer in writing of any discovered conflicts between existing installations which are not scheduled for removal.

12. All existing installations that are to be removed, abandoned, relocated, and/or capped shall be executed behind finished surfaces. All such work shall be performed in accordance with the architect’s specifications.

13. Contractor shall furnish, purchase, and deliver to the project site complete with every necessary appurtenance.

14. All openings in ceilings and plenum walls for plumbing shall be sealed air tight and protected from damage.

15. Operational tests shall be performed after completion of the work. The engineer shall certify the work as acceptable before final acceptance.

16. All fresh air intakes shall be sized and installed per the architect’s specifications.

17. The contractor shall coordinate with the electrical contractor to verify that all equipment are installed in accordance with the electrical drawings.

18. The contractor shall be responsible for determining the exact locations for equipment and rough-ins and the exact routing of piping prior to construction as to best fit the architectural drawings.

19. All equipment shall be installed in accordance with the manufacturer’s recommendations.

20. Contractor shall verify that all equipment, piping, etc., shall be free from interference with other disciplines. Where conflicts occur, the contractor shall coordinate with the appropriate parties to resolve.

21. All work to be guaranteed for one year against labor and materials. Any defective materials or workmanship, as well as damage to the building, shall be repaired or replaced at the contractor’s expense.

22. The contractor shall notify the engineer in writing of any discovered conflicts between existing installations which are not scheduled for removal.

23. All existing installations that are to be removed, abandoned, relocated, and/or capped shall be executed behind finished surfaces. All such work shall be performed in accordance with the architect’s specifications.

24. Contractor shall furnish, purchase, and deliver to the project site complete with every necessary appurtenance.

25. All openings in ceilings and plenum walls for plumbing shall be sealed air tight and protected from damage.

26. Operational tests shall be performed after completion of the work. The engineer shall certify the work as acceptable before final acceptance.

27. All fresh air intakes shall be sized and installed per the architect’s specifications.

28. The contractor shall coordinate with the electrical contractor to verify that all equipment are installed in accordance with the electrical drawings.

29. The contractor shall be responsible for determining the exact locations for equipment and rough-ins and the exact routing of piping prior to construction as to best fit the architectural drawings.

30. All equipment shall be installed in accordance with the manufacturer’s recommendations.

31. Contractor shall verify that all equipment, piping, etc., shall be free from interference with other disciplines. Where conflicts occur, the contractor shall coordinate with the appropriate parties to resolve.

32. All work to be guaranteed for one year against labor and materials. Any defective materials or workmanship, as well as damage to the building, shall be repaired or replaced at the contractor’s expense.

33. The contractor shall notify the engineer in writing of any discovered conflicts between existing installations which are not scheduled for removal.

34. All existing installations that are to be removed, abandoned, relocated, and/or capped shall be executed behind finished surfaces. All such work shall be performed in accordance with the architect’s specifications.

35. Contractor shall furnish, purchase, and deliver to the project site complete with every necessary appurtenance.

36. All openings in ceilings and plenum walls for plumbing shall be sealed air tight and protected from damage.

37. Operational tests shall be performed after completion of the work. The engineer shall certify the work as acceptable before final acceptance.

38. All fresh air intakes shall be sized and installed per the architect’s specifications.

39. The contractor shall coordinate with the electrical contractor to verify that all equipment are installed in accordance with the electrical drawings.

40. The contractor shall be responsible for determining the exact locations for equipment and rough-ins and the exact routing of piping prior to construction as to best fit the architectural drawings.

41. All equipment shall be installed in accordance with the manufacturer’s recommendations.

42. Contractor shall verify that all equipment, piping, etc., shall be free from interference with other disciplines. Where conflicts occur, the contractor shall coordinate with the appropriate parties to resolve.

43. All work to be guaranteed for one year against labor and materials. Any defective materials or workmanship, as well as damage to the building, shall be repaired or replaced at the contractor’s expense.
1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

2. ALL PLUMBING FIXTURES TO BE REMOVED IN RENNOVATED RESTROOMS.

GENERAL NOTES:

- REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.
- ALL PLUMBING FIXTURES TO BE REMOVED IN RENNOVATED RESTROOMS.

BASEMENT - WATER & GAS - DEMOLITION - PRETTYMAN
1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

2. ALL PLUMBING FIXTURES TO BE REMOVED IN RENNOVATED RESTROOMS.

GENERAL NOTES:

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KEY NOTES:

- P31: REMOVE AND DISPOSE OF EXISTING FIXTURE AND ASSOCIATED PIPING. CAP WASTE PIPING WITHIN 2 FEET OF VENTED MAIN.

BASEMENT - WATER & GAS - DEMOLITION - SCARBOROUGH

MARK DATE DESCRIPTION
FIRST FLOOR - WATER & GAS - DEMOLITION - PRETTYMAN

1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

2. ALL PLUMBING FIXTURES TO BE REMOVED IN RENOVATED RESTROOMS.

GENERAL NOTES:

1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

2. ALL PLUMBING FIXTURES TO BE REMOVED IN RENOVATED RESTROOMS.
FIRST FLOOR - WATER & GAS - DEMOLITION - SCARBOROUGH

GENERAL NOTES:
1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.
2. ALL PLUMBING FIXTURES TO BE REMOVED IN RENNOVATED RESTROOMS.

KEY NOTES
- P31 REMOVE AND DISPOSE OF EXISTING FIXTURE AND ASSOCIATED PIPING. CAP WASTE PIPING WITHIN 2 FEET OF VENTED MAIN.

SCALE: 1/8" = 1'-0"
1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

2. ALL PLUMBING FIXTURES TO BE REMOVED IN RENOVATED RESTROOMS.

SECOND FLOOR - WATER & GAS - DEMOLITION - PRETTYMAN

P31 REMOVE AND DISPOSE OF EXISTING FIXTURE AND ASSOCIATED PIPING. CAP WASTE PIPING WITHIN 2 FEET OF VENTED MAIN.
SECOND FLOOR - WATER & GAS - DEMOLITION - SCARBOROUGH

GENERAL NOTES:
1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.
2. ALL PLUMBING FIXTURES TO BE REMOVED IN RENNOVATED RESTROOMS.

PROFESSIONAL CERTIFICATION: I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND.
LICENSE NO. 23507, EXPIRATION DATE: 10/14/20

SCALE: 1/4"=1'
0'
4'
2'
8'
10'

KEY NOTES

1. REMOVE AND DISPOSE OF EXISTING FIXTURE AND ASSOCIATED PIPING. CAP WASTE PIPING WITHIN 2 FEET OF VENTED MAIN.
GENERAL NOTES:
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THIRD FLOOR - WATER & GAS - DEMOLITION - SCARBOROUGH
GENERAL NOTES:

1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

2. ALL PLUMBING FIXTURES TO BE REMOVED IN RENOVATED RESTROOMS.

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LICENSE NO. 23507, EXPIRATION DATE: 10/14/20

SCALE: 1/4" = 1'

UNIVERSITY OF MARYLAND, COLLEGE PARK
P31 REMOVE AND DISPOSE OF EXISTING FIXTURE AND ASSOCIATED PIPING. CAP WASTE PIPING WITHIN 2 FEET OF VENTED MAIN.

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FIRST FLOOR - DWV & STORM - DEMOLITION - SCARBOROUGH
SECOND FLOOR - DWV & STORM
- DEMOLITION - PRETTYMAN

KEY NOTES

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1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

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- ALL PLUMBING FIXTURES TO BE REMOVED IN RENOVATED RESTROOMS.

SECOND FLOOR - DWV & STORM - DEMOLITION - SCARBOROUGH

KEY NOTES

Key | Value | Keynote Text
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P31 | REMOVE AND DISPOSE OF EXISTING FIXTURE AND ASSOCIATED PIPING. CAP WASTE PIPING WITHIN 2 FEET OF VENTED MAIN.

MARK DATE DESCRIPTION

SECOND FLOOR - DWV & STORM - DEMOLITION - SCARBOROUGH
1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.
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TOWSON UNIVERSITY 8000 YORK ROAD TOWSON MD/21252

ALEX CLARK
KEVIN CLARK 100% SUBMISSION 01-17-19

TU PRETTMAN SCARBOROUGH TOILET ROOMS RENOVATIONS PRETTYMAN DORMITORY
THIRD FLOOR - DWV & STORM - DEMOLITION - PRETTYMAN
1/8" = 1'-0"
1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

2. ALL PLUMBING FIXTURES TO BE REMOVED IN RENNOVATED RESTROOMS.

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**GENERAL NOTES:**

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**DRAWING**

**PROJECT:**

**BUILDING:**

**CONTRACTORS:**

**REVISIONS:**

**SEAL:**

**Architect and Engineer Name and LOGO:**

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**PROJECT TITLE:**

**DRAWING TITLE:**

**FILE NAME:**

**DRAWING NO.:**

**DESIGNED BY:**

**DRAWN BY:**

**DATE:**

**CHECKED BY:**

**OF SHEET NUMBER:**

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**NAME:**

**WRK REQ. NO.:**

**PROJ. OFFICER:**

**PROJ. MGR.:**

**SUB. DATE:**

**SUBMISSION:**

**PROJ. NO.:**

**STREET:**

**CITY:**

**STATE/ZIP:**

**OTHER:**

**BUILDING NO.:**

**PRIME A/E:**

**SUB A/E:**

**CONSTR. CON.:**

**FACILITY CODE:**

**BUILDING NO.:**

**A/E CON. NO.:**

**A/E TASK NO.:**

**CONS. CONTR.:**

**CONS. WORK:**

---

**ARCHITECT:**

**MEP ENGINEER:**

**STRUCTURAL ENGINEER:**

---

**LSY ARCHITECTS**

**BUILDING NO. TOWSON UNIVERSITY**

**TOWSON MD/21252**

**ALEX CLARK**

**KEVIN CLARK 100% SUBMISSION 01-17-19**

---

**PD133S**

---

**SCARBOROUGH DORMITORY**

**THIRD FLOOR - DWV & STORM - DEMOLITION - SCARBOROUGH**

---

**SCALE:**

1/4" = 1' - 0"
1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

2. PROVIDE SHUT-OFF VALVES FOR ALL BRANCHES OFF MAIN RISER.

3. SEE RISER DIAGRAM FOR ADDITIONAL INFORMATION.

GENERAL NOTES:

1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

2. PROVIDE SHUT-OFF VALVES FOR ALL BRANCHES OFF MAIN RISER.

3. SEE RISER DIAGRAM FOR ADDITIONAL INFORMATION.

PROFESSIONAL CERTIFICATION:

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LICENSE NO. 23507, EXPIRATION DATE:10/14/20

SCALE: 1/8"=1'-0"

DRAWING PROJECT BUILDING CONTRACTORS REVISIONS SEAL

FILE NAME DRAWING NO. DESIGNED BY DRAWN BY DATE CHECKED BY

OF SHEET NUMBER

NAME WRK REQ. NO. PROJ. OFFICER PROJ. MGR. SUB. DATE SUBMISSION PROJ. NO. STREET CITY STATE/ZIP OTHER

BUILDING NO. PRIME A/E SUB A/E CONSTR. CON.

CONS. CONTR. CONS. WORK

ARCHITECT: MEP ENGINEER: STRUCTURAL: ENGINEER

LOUVIERE, STRATON & YOKEL, LLC 8484 GEORGIA AVE, SUITE 650 SILVER SPRING, MD 20910 (301) 588-1500 GLOBAL ENGINEERING SOLUTIONS, LLC 8509 CHURCHILL DOWNS ROAD, GAITHERSBURG, MD 20882 (240) 888-9548

LSY ARCHITECTS

BUILDING NO. TOWSON UNIVERSITY 8000 YORK ROAD TOWSON MD/21252

ALEX CLARK KEVIN CLARK 100% SUBMISSION 01-17-19

TU PRETTMAN SCARBOROUGH TOILET ROOMS RENOVATIONS PRETTYMAN DORMITORY

BASEMENT - WATER & GAS - NEW WORK - PRETTYMAN

BASEMENT - WATER & GAS - NEW WORK - PRETTYMAN - ENLARGED

PRETTYMAN CEMETERY

KEY NOTES

Key Value Keynote Text
1. Refer to P001 for general notes, symbol legend and list of abbreviations.
2. Provide shut-off valves for all branches off main riser.
3. See riser diagram for additional information.
1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

2. PROVIDE SHUT-OFF VALVES FOR ALL BRANCHES OFF MAIN RISER.

3. SEE RISER DIAGRAM FOR ADDITIONAL INFORMATION.
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3. SEE RISER DIAGRAM FOR ADDITIONAL INFORMATION.

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1. REFER TO FIG. FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.
2. PROVIDE SHUT-OFF VALVES FOR ALL BRANCHES OFF MAIN RISER.
3. SEE RISER DIAGRAM FOR ADDITIONAL INFORMATION.
SECOND FLOOR - WATER & GAS
NEW WORK - PRETTYMAN

SECOND FLOOR - WATER & GAS
NEW WORK - PRETTYMAN
ENLARGED WEST

SECOND FLOOR - WATER & GAS
NEW WORK - PRETTYMAN
ENLARGED EAST

KEY NOTES

P04 1" CW/HW DN & 3/4" CW/HW UP.
P10 2" CW DN & 1-1/2" CW UP.
1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.
2. PROVIDE SHUT-OFF VALVES FOR ALL BRANCHES OFF MAIN RISER.
3. SEE RISER DIAGRAM FOR ADDITIONAL INFORMATION.

GENERAL NOTES:

1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.
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SECOND FLOOR - WATER & GAS - NEW WORK - SCARBOROUGH - ENLARGED WEST

SECOND FLOOR - WATER & GAS - NEW WORK - SCARBOROUGH - ENLARGED EAST

SECOND FLOOR - WATER & GAS - NEW WORK - SCARBOROUGH
1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.
2. PROVIDE SHUT-OFF VALVES FOR ALL BRANCHES OFF MAIN RISER.
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THIRD FLOOR - WATER & GAS - NEW WORK - PRETTYMAN

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THIRD FLOOR - WATER & GAS - NEW WORK - SCARBOROUGH - ENLARGED WEST

THIRD FLOOR - WATER & GAS - NEW WORK - SCARBOROUGH - ENLARGED EAST

THIRD FLOOR - WATER & GAS - NEW WORK - SCARBOROUGH

P05 3/4" CW/HW DN. P11 1-1/2" CW DN.
1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

2. ALL SANITARY PIPING SHOWN ON FLOOR PLAN IS ASSOCIATED WITH FLOOR ABOVE, UNLESS NOTED.

3. SEE RISER DIAGRAM FOR ADDITIONAL INFORMATION.

GENERAL NOTES:

PROFESSIONAL CERTIFICATION: I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND. LICENSE NO. 23507, EXPIRATION DATE: 10/14/20

SCALE: 1/4" = 1'

ARCHITECT: LOUVIERE, STRATON & YOKEL, LLC 8484 GEORGIA AVE, SUITE 650 SILVER SPRING, MD 20910 (301) 588-1500

MEP ENGINEER: COMPREHENSIVE STRUCTURAL SOLUTIONS, LLC 8509 CHURCHILL DOWNS ROAD, GAITHERSBURG, MD 20882 (240) 888-9548

STRUCTURAL: ENGINEER: (301) 216-2871

BUILDING NO. TOWSON UNIVERSITY 8000 YORK ROAD TOWSON MD/21252 18503

ALEX CLARK 100% SUBMISSION 01-17-19

TU PRETTMAN SCARBOROUGH

TOILET ROOMS RENOVATIONS PRETTYMAN DORMITORY PRETTYMAN DORMITORY PRETTYMAN DORMITORY BASEMENT - DWV & STORM - NEW WORK - PRETTYMAN - ENLARGED WEST

BASEMENT - DWV & STORM - NEW WORK - PRETTYMAN - ENLARGED EAST

KEY NOTES

P15 2" SAN UP. P22 4" SAN UP. P24 1-1/2" SAN UP TO P-2. P26 2" VENT UP. P32 PROVIDE TRAP PRIMER ON FLOOR DRAIN (NOT SHOWN).
GENERAL NOTES:
1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.
2. ALL SANITARY PIPING SHOWN ON FLOOR PLAN IS ASSOCIATED WITH FLOOR ABOVE, UNLESS NOTED.
3. SEE RISER DIAGRAM FOR ADDITIONAL INFORMATION.

NOTE: ALL SAN PIPING SHOWN IS BELOW SLAB

PROFESSIONAL CERTIFICATION: I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND. LICENSE NO. 23507, EXPIRATION DATE: 10/14/20

DRAWING PROJECT BUILDING CONTRACTORS REVISIONS SEAL

FILE NAME DRAWING NO. DESIGNED BY DRAWN BY DATE CHECKED BY

CHECKER AUTHOR DESIGNER

GENERAL NOTES:

BASEMENT - DWV & STORM - NEW WORK - SCARBOROUGH - ENLARGED

BASEMENT - DWV & STORM - NEW WORK - SCARBOROUGH

PRINT VIEW - BASEMENT - DWV & STORM - NEW WORK - ENLARGED

SCALE: 1/4" = 1'-0"

1/8" = 1'-0"
1. Refer to P001 for general notes, symbol legend and list of abbreviations.

2. All sanitary piping shown on floor plans is associated with floor above, unless noted.

3. See riser diagram for additional information.

GENERAL NOTES:

- All sanitary piping shown on floor plans is associated with floor above, unless noted.
- See riser diagram for additional information.
FIRST FLOOR - DWV & STORM - NEW WORK - SCARBOROUGH - ENLARGED WEST

FIRST FLOOR - DWV & STORM - NEW WORK - SCARBOROUGH - ENLARGED EAST

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3. SEE RISER DIAGRAM FOR ADDITIONAL INFORMATION.

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<td>2&quot; SAN UP/DN</td>
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<tr>
<td>P17</td>
<td>2&quot; SAN DN</td>
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<tr>
<td>P21</td>
<td>3&quot; SAN UP &amp; 4&quot; SAN DN</td>
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<td>P26</td>
<td>2&quot; VENT UP</td>
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LICENSE NO. 23507, EXPIRATION DATE: 10/14/20

SCALE: 1/4" = 1'

DRAWING PROJECT BUILDING CONTRACTORS REVISIONS SEAL

ARCHITECT AND ENGINEER NAME AND LOGO

DRAWN BY DATE

CHECKED BY

NAME

L. M. TOWSON UNIVERSITY 8000 YORK ROAD TOWSON MD / 21252

ALX CLARK KEVIN CLARK 100% SUBMISSION 01-17-19

PRIME A/E SUB A/E

CONS. CONTR. CONS. WORK

ARCHITECT: MEP ENGINEER: STRUCTURAL: ENGINEER

LSY ARCHITECTS GES

BUILDING NO. TOWSON UNIVERSITY 8000 YORK ROAD M02320

ALEX CLARK KEVIN CLARK 100% SUBMISSION 01-17-19

TU PRETTMAN SCARBOROUGH

TOILET ROOMS RENOVATIONS PRETTYMAN DORMITORY PRETTYMAN DORMITORY PRETTYMAN DORMITORY

SECOND FLOOR - DWV & STORM - NEW WORK - PRETTYMAN

SECOND FLOOR - DWV & STORM - NEW WORK - PRETTYMAN - ENLARGED WEST

SECOND FLOOR - DWV & STORM - NEW WORK - PRETTYMAN - ENLARGED EAST

KEY NOTES

P15 2" SAN UP. P16 2" SAN UP/DN. P17 2" SAN DN. P20 3" SAN DN. P26 2" VENT UP. P32 PROVIDE TRAP PRIMER ON FLOOR DRAIN (NOT SHOWN).

1/8" = 1'-0"
1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.
2. ALL SANITARY PIPING SHOWN ON FLOOR PLAN IS ASSOCIATED WITH FLOOR ABOVE, UNLESS NOTED.
3. SEE RISER DIAGRAM FOR ADDITIONAL INFORMATION.

SECOND FLOOR - DWV & STORM - NEW WORK - SCARBOROUGH - ENLARGED EAST

SECOND FLOOR - DWV & STORM - NEW WORK - SCARBOROUGH - ENLARGED WEST

KEY NOTES

P17 2" SAN DN. P20 3" SAN DN. P26 2" VENT UP. P32 PROVIDE TRAP PRIMER ON FLOOR DRAIN (NOT SHOWN).

SCALE: 1/4"=1'-0"
1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.
2. ALL SANITARY PIPING SHOWN ON FLOOR PLAN IS ASSOCIATED WITH FLOOR ABOVE, UNLESS NOTED.
3. SEE RISER DIAGRAM FOR ADDITIONAL INFORMATION.
1. REFER TO P001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.
2. ALL SANITARY PIPING SHOWN ON FLOOR PLAN IS ASSOCIATED WITH FLOOR ABOVE, UNLESS NOTED.
3. SEE RISER DIAGRAM FOR ADDITIONAL INFORMATION.

GENERAL NOTES:

P133S

1/8" = 1'-0"
PLUMBING FIXTURE SCHEDULE

<table>
<thead>
<tr>
<th>Description</th>
<th>Basis of Design</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>WATER CLOSET</td>
<td>AMERICAN STANDARD MODERN MODEL 3043.001</td>
<td>PROVIDE SLOAN 111 SMO OR SENSOR FLUSH VALVE</td>
</tr>
<tr>
<td>LINE CLEANOUT</td>
<td>PPP, INC. MODEL SC-500</td>
<td>PROVIDE SLOAN 111 SMO OR SENSOR FLUSH VALVE</td>
</tr>
<tr>
<td>STACK CLEANOUT</td>
<td>PPP, INC. MODEL SC-750</td>
<td>PROVIDE SLOAN 111 SMO OR SENSOR FLUSH VALVE</td>
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<tr>
<td>LINE CLEANOUT</td>
<td>PPP, INC. MODEL SC-1000</td>
<td>PROVIDE SLOAN 111 SMO OR SENSOR FLUSH VALVE</td>
</tr>
<tr>
<td>STACK CLEANOUT</td>
<td>PPP, INC. MODEL SC-1250</td>
<td>PROVIDE SLOAN 111 SMO OR SENSOR FLUSH VALVE</td>
</tr>
<tr>
<td>LINE CLEANOUT</td>
<td>PPP, INC. MODEL SC-1500</td>
<td>PROVIDE SLOAN 111 SMO OR SENSOR FLUSH VALVE</td>
</tr>
<tr>
<td>STACK CLEANOUT</td>
<td>PPP, INC. MODEL SC-2000</td>
<td>PROVIDE SLOAN 111 SMO OR SENSOR FLUSH VALVE</td>
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</tbody>
</table>

DRAIN SCHEDULE

<table>
<thead>
<tr>
<th>ID</th>
<th>SERVICE</th>
<th>CODE</th>
<th>Date of Change</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GENERAL FLOOR DRAIN</td>
<td>FD</td>
<td>Zurn Z415</td>
<td>PROVIDE TRAP PRIMER CONNECTION</td>
</tr>
<tr>
<td>2</td>
<td>SHOWER TRENCH DRAIN</td>
<td>TD</td>
<td>Zurn ZS880</td>
<td>PROVIDE TRAP PRIMER CONNECTION</td>
</tr>
</tbody>
</table>

WATER HAMMER ARRESTOR SCHEDULE

<table>
<thead>
<tr>
<th>PDI</th>
<th>MIN-MAX</th>
<th>FIXTURE UNIT CAPACITY</th>
<th>CONNECTION SIZE</th>
<th>MANUFACTURER &amp; MODEL NUMBER (OR EQUAL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;A&quot;</td>
<td>1-11</td>
<td>PPP, INC. MODEL SC-500</td>
<td>1/2&quot;</td>
<td>&quot;B&quot; 12-32 PPP, INC. MODEL SC-750</td>
</tr>
<tr>
<td>&quot;C&quot;</td>
<td>33-60</td>
<td>PPP, INC. MODEL SC-1000</td>
<td>1&quot;</td>
<td>&quot;D&quot; 61-113 PPP, INC. MODEL SC-1250</td>
</tr>
<tr>
<td>&quot;E&quot;</td>
<td>114-154</td>
<td>PPP, INC. MODEL SC-1500</td>
<td>1-1/2&quot;</td>
<td>&quot;F&quot; 155-330 PPP, INC. MODEL SC-2000</td>
</tr>
</tbody>
</table>

SLOPE OF HORIZONTAL DRAINAGE PIPE

<table>
<thead>
<tr>
<th>Size (inch)</th>
<th>Minimum Slope</th>
<th>Maximum Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1/16</td>
<td>1/8</td>
</tr>
<tr>
<td>3</td>
<td>1/8</td>
<td>1/4</td>
</tr>
<tr>
<td>4</td>
<td>1/4</td>
<td>1/2</td>
</tr>
</tbody>
</table>

CLEANOUT SCHEDULE

<table>
<thead>
<tr>
<th>No.</th>
<th>APPLICATION</th>
<th>SIZE OF OPENING OR EA (IN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>WATER CLOSET</td>
<td>PPP, INC. MODEL SC-500</td>
</tr>
</tbody>
</table>
1. All pipe hangers shall be painted with rust inhibiting paint as specified.

2. Branch pipes with developed lengths of 75' or greater may have arrestors reduced by one size.

3. Shock arrestors shall be installed on all branch piping serving plumbing fixtures, quick closing, valves, equipment, or wall hydrants/hose bibs. Hydraulic hams.

4. Shock arrestors shall be certified by the Plumbing and Drainage Institute (PDI).

5. When working water pressure exceeds 65 PSI use next largest size.

6. Shock arrestors shall be installed in all branch piping serving plumbing fixtures, quick closing, valves, equipment, or wall hydrants/hose bibs. All installations as directed by manufacturer.

7. All pipe hangers shall be painted with rust inhibiting paint as specified.

8. Branch pipes with developed lengths of 75' or greater may have arrestors reduced by one size.

9. Branch pipes with developed lengths of 75' or greater may have arrestors reduced by one size.

10. Shock arrestors shall be certified by the Plumbing and Drainage Institute (PDI).

11. Hydraulic hams.

12. Shock arrestors shall be installed on all branch piping serving plumbing fixtures, quick closing, valves, equipment, or wall hydrants/hose bibs. All installations as directed by manufacturer.

13. All pipe hangers shall be painted with rust inhibiting paint as specified.
D1. All materials, appliances, equipment, tools, transportation, and other work shall be coordinated with the architect and engineer.

D2. Material and appliance selection should be made from the approved manufacturers list. Where applicable, all equipment shall be in accordance with the latest adopted national electrical code and all other local codes and authorities having jurisdiction.

D3. The contractor shall perform all work in accordance with the national electrical code and local electrical code requirements, and the maximum unbalanced current in neutral does not exceed the capacity of the wire, no more than 3 single phase circuit shall be installed in one raceway. Eliminate splices wherever possible, and where necessary, provide splices with isolation devices.

D4. All electrical equipment installed in the structure shall be installed to conform with electrical code requirements. All work shall be performed in strict accordance with the national electrical code and all other local codes and authorities having jurisdiction. All equipment designed, installed, and tested shall be in accordance with the latest adopted national electrical code and all other local codes and authorities having jurisdiction.

D5. The contractor shall coordinate the installation of electrical work with architectural, structural, and mechanical installations. Should any electrical work interfere with the installation of the above, the contractor shall alter the same.

D6. The contractor shall provide a proper schedule of electrical work for review by the owner.

D7. The contractor shall provide all necessary labor, materials, and equipment as required to complete the work specified herein.

D8. The contractor shall furnish all labor, materials, and equipment as required to complete the work specified herein. The contractor shall coordinate all work with the architect and engineer.

D9. The contractor shall be responsible for the coordination of electrical work with architectural, structural, and mechanical installations. The contractor shall be responsible for the coordination of electrical work with the work of other trades and the equipment of other trades.

D10. The contractor shall coordinate all work with the architect and engineer. The contractor shall be responsible for the coordination of electrical work with architectural, structural, and mechanical installations. The contractor shall be responsible for the coordination of electrical work with the work of other trades and the equipment of other trades.

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GENERAL NOTES:
PROJECT: TOWSON UNIVERSITY - TOWSON UNIVERSITY
LEAD A/E: LSY ARCHITECTS
LEAD CONSTRUCTION: GES
BASEMENT - LIGHTING - DEMOLITION - PRETTYMAN

1 DISCONNECT AND REMOVE EXISTING FIXTURE.
EXISTING LIGHTING CIRCUIT TO REMAIN AND BE USED FOR NEW LIGHTING CONNECTION.

KEYED NOTES:

BASEMENT - LIGHTING - DEMOLITION - PRETTYMAN

1. REFER TO E001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.
GENERAL NOTES:

1. DISCONNECT AND REMOVE EXISTING FIXTURE.

EXISTING LIGHTING CIRCUIT TO REMAIN AND BE USED FOR NEW LIGHTING CONNECTION.
1. FIRST FLOOR - LIGHTING - DEMOLITION - SCARBOROUGH
SECOND FLOOR - LIGHTING - DEMOLITION - PRETTYMAN

1. DISCONNECT AND REMOVE EXISTING FIXTURE.

EXISTING LIGHTING CIRCUIT TO REMAIN AND BE USED FOR NEW LIGHTING CONNECTION.
SECOND FLOOR - LIGHTING - DEMOLITION - SCARBOROUGH

1. DISCONNECT AND REMOVE EXISTING FIXTURE.
2. EXISTING LIGHTING CIRCUIT TO REMAIN AND BE USED FOR NEW LIGHTING CONNECTION.

ED112S
THIRD FLOOR - LIGHTING - DEMOLITION - PRETTYMAN

1. DISCONNECT AND REMOVE EXISTING FIXTURE.

EXISTING LIGHTING CIRCUIT TO REMAIN AND BE USED FOR NEW LIGHTING CONNECTION.
1. REFER TO E001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

TOWSON UNIVERSITY

TOWSON
MD/21252

100% SUBMISSION
01-17-18

TU PRETTMAN SCARBOROUGH

TOILET ROOMS RENOVATIONS

SCARBOROUGH DORMITORY

#3

1/4" = 1'-0"  THIRD FLOOR - LIGHTING - DEMOLITION - SCARBOROUGH

1. DISCONNECT AND REMOVE EXISTING FIXTURE.

EXISTING LIGHTING CIRCUIT TO REMAIN AND BE USED FOR NEW LIGHTING CONNECTION.
1. DISCONNECT AND REMOVE EXISTING FIXTURE.

EXISTING LIGHTING CIRCUIT TO REMAIN AND BE USED FOR NEW LIGHTING CONNECTION.
1. DISCONNECT AND REMOVE EXISTING FIXTURE.

EXISTING LIGHTING CIRCUIT TO REMAIN AND BE USED FOR NEW LIGHTING CONNECTION.
1. REFER TO E001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

EXISTING PANEL 1S 100A
EXISTING PANEL 1N 100A
TOILET ROOM / SHOWER ROOM 114S
UNISEX RESTROOM 105S
UNISEX RESTROOM 107S

GENERAL NOTES:
PLOTTED TO SCALE 1/4"=1'-0".

KEYED NOTES:

EXISTING PANEL 1S 100A
EXISTING PANEL 1N 100A
EXISTING LIGHTING CIRCUIT TO REMAIN AND BE USED FOR NEW LIGHTING CONNECTION.

FIRST FLOOR - POWER - DEMOLITION - SCARBOROUGH

DISCONNECT AND REMOVE EXISTING FIXTURE.

MARK DATE DESCRIPTION

1/4" = 1'-0"
SECOND FLOOR - POWER - DEMOLITION - PRETTYMAN

1. DISCONNECT AND REMOVE GFI EXISTING RECEPTACLE. EXISTING CIRCUIT AND JUNCTION BOX TO REMAIN AND BE USED FOR NEW RECEPTACLE CONNECTION.
SECOND FLOOR - POWER - DEMOLITION - SCARBOROUGH

1. DISCONNECT AND REMOVE EXISTING FIXTURE.

EXISTING LIGHTING CIRCUIT TO REMAIN AND BE USED FOR NEW LIGHTING CONNECTION.
GENERAL NOTES:

1. REFER TO E001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

KEYED NOTES:

EXISTING PANEL 3N 100A
EXISTING PANEL 3S 100A
TOILET ROOM / SHOWER ROOM 304P
TOILET ROOM / SHOWER ROOM 305P

PROFESSIONAL CERTIFICATION:

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND. LICENSE NO. 44228, EXPIRATION DATE: 07/11/19

SCALE: 1/4" = 1'-0"

THIRD FLOOR - POWER - DEMOLITION - PRETTYMAN

1 DISCONNECT AND REMOVE GFI EXISTING RECEPTACLE. EXISTING CIRCUIT AND JUNCTION BOX TO REMAIN AND BE USED FOR NEW RECEPTACLE CONNECTION.
GENERAL NOTES:
- TOWSON UNIVERSITY
- TOILET ROOMS RENOVATIONS
- SCARBOROUGH DORMITORY

KEYED NOTES:
- THIRD FLOOR - POWER - DEMOLITION - SCARBOROUGH
- DISCONNECT AND REMOVE GFI EXISTING RECEPTACLE. EXISTING CIRCUIT AND JUNCTIONBOX TO REMAIN AND BE USED FOR NEW RECEPTACLE CONNECTION.

SCALE: 1/4" = 1'-0"
1. Refer to E001 for general notes, symbol legend and list of abbreviations.

2. The emergency lighting fixture shall be wired in such a way that the occupancy sensor can turn it "off" when the toilet is vacant. However, it shall turn "on" if the normal power to the circuit is lost.
1. REFER TO E001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS

2. THE EMERGENCY LIGHTING FIXTURE SHALL BE WIRED IN SUCH A WAY THAT THE OCCUPANCY SENSOR CAN TURN IT "OFF" WHEN THE TOILET IS VACANT. HOWEVER, IT SHALL TURN "ON" IF THE NORMAL POWER TO THE CIRCUIT IS LOST.
1. REFER TO E001 FOR GENERAL NOTES, SYMBOLS, AND LEGENDS.
2. THE EMERGENCY LIGHTING FIXTURE SHALL BE WIRED IN SUCH A WAY THAT THE OCCUPANCY SENSOR CAN TURN IT "OFF" WHEN THE TOILET IS VACANT. HOWEVER, IT SHALL TURN "ON" IF THE NORMAL POWER TO THE CIRCUIT IS LOST.

GENERAL NOTES:

KEYED NOTES:

1 CONNECT TO EXISTING CIRCUIT SERVING THIS AREA.
1. REFER TO E001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS

2. THE EMERGENCY LIGHTING FIXTURE SHALL BE WIRED IN SUCH A WAY THAT THE OCCUPANCY SENSOR CAN TURN IT "OFF" WHEN THE TOILET IS VACANT. HOWEVER, IT SHALL TURN "ON" IF THE NORMAL POWER TO THE CIRCUIT IS LOST.

---

**GENERAL NOTES:**

---

**KEYED NOTES:**

---

**SCALE:** 1/4"=1'-0"
1. REFER TO E001 FOR GENERAL NOTES, SYMBOLLEGEND AND LIST OF ABBREVIATIONS
2. THE EMERGENCY LIGHTING FIXTURE SHALL BE WIRED IN SUCH A WAY THAT THE OCCUPANCY SENSOR CAN TURN IT "OFF" WHEN THE TOILET IS VACANT. HOWEVER, IT SHALL TURN "ON" IF THE NORMAL POWER TO THE CIRCUIT IS LOST.
1. REFER TO E001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

2. MAXIMUM LOAD IN EXISTING 120V CIRCUIT SHALL NOT EXCEED 1440VA.
1. REFER TO E001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS

2. THE EMERGENCY LIGHTING FIXTURE SHALL BE WIRED IN SUCH A WAY THAT THE OCCUPANCY SENSOR CAN TURN IT "OFF" WHEN THE TOILET IS VACANT. HOWEVER, IT SHALL TURN "ON" IF THE NORMAL POWER TO THE CIRCUIT IS LOST.
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1. REFER TO E001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

2. MAXIMUM LOAD IN EXISTING 120V CIRCUIT SHALL NOT EXCEED 1440VA.

BASEMENT - POWER - NEW WORK - PRETTYMAN

1 INSTALL NEW JUNCTION BOX IN CEILING SPACE AND EXTEND EXISTING WIRING TO NEW RECEPTACLES AS SHOWN.
1. REFER TO EVE FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

2. MAXIMUM LOAD IN EXISTING 120V CIRCUIT SHALL NOT EXCEED 1440VA.
1. REFER TO E001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.

2. MAXIMUM LOAD IN EXISTING 120V CIRCUIT SHALL NOT EXCEED 1440VA.
1. REFER TO E001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.
2. MAXIMUM LOAD IN EXISTING 120V CIRCUIT SHALL NOT EXCEED 1440VA.

SECOND FLOOR - POWER - NEW WORK - SCARBOROUGH

MARK DATE DESCRIPTION
1. REFER TO E001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.
2. MAXIMUM LOAD IN EXISTING 120V CIRCUIT SHALL NOT EXCEED 1440VA.

TOILET ROOM / SHOWER ROOM
304P

EXISTING PANEL 3S
225A

EXISTING PANEL 3N
225A

(E)

1/4" = 1'-0"

THIRD FLOOR - POWER - NEW WORK - PRETTYMAN

PRETTYMAN CEMETARY
1. REFER TO E001 FOR GENERAL NOTES, SYMBOL LEGEND AND LIST OF ABBREVIATIONS.
2. MAXIMUM LOAD IN EXISTING 120V CIRCUIT SHALL NOT EXCEED 1440VA.
BID/PRICE PROPOSAL FORM

BIDDER’S NAME: ____________________________________________________________

PROJECT TITLE: Prettyman & Scarborough Bathroom Renovations

PROJECT NUMBER: TU-1942-SBR

Failure to properly complete each blank may be cause for rejection of this proposal.

Having carefully examined the solicitation documents, including all addenda acknowledged on Exhibit K attached hereto, being collectively referred to as the Contract Documents, and having received clarification on all items of conflict or upon which any doubt arose, the undersigned proposes to furnish all labor, materials and equipment required by the said documents for the entire work, all in strict accordance with the Contract Documents, for the sum of:

TOTAL COST OF PROJECT

BASE BID ________________________________________________________________ $ __________________

Words __________________________ Numbers __________________________

If the undersigned is notified by the Procurement Officer/Representative of the acceptance of the bid within 90 days after the bid date, Contractor agrees to guarantee the completion of this work as specified in the Contract Documents.

_________________________ ___________________________ ___________________________
Firm License Number Date Issued Place of Issuance
(If Applicable)

Minority Business Enterprises:

The undersigned certifies that the Bidder:

_____ IS NOT a Certified Minority Business Enterprise.

_____ IS a Minority Business Enterprise (MBE), certified by the Maryland Department of Transportation, and assigned the following certification number: __________________________

(Certification Number)
The undersigned affirms, and it is a condition precedent to acceptance of this bid, that the bidder has not been a party to any agreement to bid a fixed or uniform price.

INDIVIDUAL PRINCIPAL

Firm Name: ____________________________

Address: __________________________________________

________________________________________

Phone/Fax No.: ____________________________

E-mail Address: ____________________________

Federal Tax ID or Social Security No.

Witness: ____________________________ Signed: ____________________________

CO-PARTNERSHIP PRINCIPAL

Address: __________________________________________

________________________________________

Phone/Fax No.: ____________________________

E-mail Address: ____________________________

Federal Tax ID or Social Security No.

In the Presence of

Witness: ____________________________ By: ____________________________

Witness: ____________________________ By: ____________________________

Witness: ____________________________ By: ____________________________

By: ____________________________

Partner

CORPORATE PRINCIPAL

Name of Corporation

Address: __________________________________________

________________________________________

Phone/Fax No.: ____________________________

E-mail Address: ____________________________

Federal Tax ID Number

By: ____________________________

Signature of Officer or Authorized Agent
(Affix Corporate Seal)

Printed Name

Title

Witness: ____________________________
EXHIBIT A-1
ENVIRONMENTAL HEALTH AND SAFETY REQUIREMENTS

The Contractor must contact the TU’s Department of Environmental Health and Safety (EHS) (410-704-2949) immediately following any spill of a hazardous material in excess of one (1) quart.

1. Occupational Safety And Health Act (O.S.H.A.)
All materials, supplies, equipment, or services supplied as a result of this Contract shall comply with the applicable US and Maryland Occupational Safety and Health Act standards.

2. Hazard Communication Standard
The Contractor will be responsible for advising all of its employees of their rights under the University's Hazard Communication Program, or more commonly referred to as the Right To Know (RTK) Program. The University will supply the vendor with sufficient copies of its Employee Safety Program (ESP) booklet which outlines this program. Each and every Contractor who physically works on campus shall be required to sign a form acknowledging the receipt of the ESP booklet and their rights/responsibilities pursuant to this program. The University's Department of Environmental Health and Safety is responsible for administering the RTK program and will handle all information regarding this program. Failure to adhere to the requirements of the RTK Program may result in implementation of punitive action such as the cancellation of the contract(s).

Pursuant to the provisions of the RTK Program, the Contractor will be responsible for the following:

a. Submission to the Contract Services Office and EHS of a complete list of all chemicals or chemical products to be used on the University's property. This listing shall include the chemical name, common name, manufacturer's name, quantity and location (building and room number) for each product. This listing shall be given to EHS by no later than two (2) weeks prior to the start of any work under this contract. Changes, additions, or deletions to the complete campus chemical list must be submitted in writing five (5) working days prior to the actual change occurring. All proposed changes must be approved in writing by EHS prior to the actual use of the new product on campus.

b. Submission to the Contract Services Office and EHS of the manufacturer's Material Safety Data Sheet (MSDS) for all chemicals or chemical products to be used or in use at the University. These MSDS's for any changes or additions to the complete campus chemical list must be submitted five (5) working days prior to the actual change occurring. All proposed changes must be approved in writing by EHS prior to the actual use of the new product on campus. The University, through EHS, reserves the right to order a change in the use, storage, or method of handling of any chemical/chemical product that it feels poses an unreasonable hazard to the University's community.

c. The Contractor must warrant in writing to Towson University's Contract Administrator that all employees have been trained and will continue to be trained in the proper and safe storage, handling, use and disposal of all chemicals/chemical products in use.

d. The Contractor agrees to obey and follow all local, state, and federal regulations regarding the storage, handling, use and disposal of all chemicals/chemical products. The Contractor agrees to properly dispose of all regulated waste in accordance with all applicable regulations and to make available to EHS all records necessary to support such activity.

3. Asbestos
The Contractor is responsible for training and equipping all personnel concerning work in asbestos environments as applicable. They must be trained as prescribed by COMAR 26.11.21. All new employees must be trained within 30 days after they are hired by the Contractor. This is to be accomplished at no additional cost to this contract or the University. An initial report on all employees as to their asbestos training will be presented to the Contract Administrator within the first 90 days of the Contract and updated on a monthly basis. Thereafter, failure to comply with this requirement would place the Contractor in default status.

4. Lead Paint
The Contractor is responsible for training and equipping all personnel concerning work in lead paint containing environments as applicable. Employees must be trained as required within 60 days of contract commencement and all new employees must be trained within 30 days after they are hired by the Contractor. This training will be provided by the Contractor at no additional cost to this contract or the University. An initial report on all employees as to their lead paint training will be presented to the Contract Administrator within the first 90 days of the contract and updated on a monthly basis. Thereafter, failure to comply with this requirement would place the Contractor in default status.

5. Fire Safety
The Contractor agrees to comply with and follow all local, state, federal and University regulations regarding fire safety. It is the Contractor's sole responsibility to become familiar with all of the applicable regulations and policies. Copies of the University's policies and procedures are available from EHS.

The Contractor will be responsible for the following:

a. To provide all of its employees with sufficient training to ensure that they are fully aware of all pertinent regulations and policies in effect regarding fire safety.

b. To ensure that all of its employees are aware of and react to the University's Emergency Procedures including, but not limited to, fire
drills and evacuations. All employees must be instructed on the proper personnel to call to report an emergency.

c. All portable electrical devices including extension cords should be disconnected at the completion of the work assigned. All electrical equipment must be approved by Underwriters Laboratory and maintained in good working order. Under no circumstances shall damaged electrical equipment be utilized on this campus.

d. After pulling the fire alarm, evacuate the building to a safe location and contact the University Police by dialing extension 42133 immediately. If using a pay phone, dial 911 direct.

e. SMOKING IS NOT ALLOWED IN ANY OF THE BUILDINGS. Any employee of the Contractor, who wishes to smoke during a designated break, must do so outside.

The Contractor is responsible for fully complying with TU Hot Works Permitting Program. A Hot Works Permit is required any time a Contractor is doing any work on campus involving an actual or potential source of ignition (e.g., arc or gas welding, torch cutting, brazing, open flame soldering, grinding, fired space heaters, etc.); or may potentially cause the activation of a building fire alarm system; or may cause building occupants to notify emergency response agencies about the smell of smoke, heat, etc.

Hot Works Permits are issued prior to the start of the work by EHS at 410-704-2949. The Contractor assumes all responsibility for any work delays associated with noncompliance with the Hot Works Permit Program.

6. Bloodborne Pathogens
The Contractor will be responsible for providing the required training dealing with occupational exposure to bloodborne pathogens. Employees who have received this training may be required to perform services in areas where they may be at risk of exposure to blood or other potentially infectious materials. Some responsibilities will include collection of domestic trash in areas that generate special medical waste, regular cleaning in these areas and spill response for accidents that occur on campus that involve blood. Employees must be informed on the potential hazards present in these areas and the proper protective measures that can be taken to prevent exposure. EHS is available to provide more information concerning the areas on campus where personnel are at risk of exposure.

7. Confined Space Entry
The Contractor agrees to comply with all local, state and federal regulations pertaining to the entry into confined spaces. The Contractor is responsible for contacting the TU’s Contract Services Manager in the Department of Facilities Management for the location of all campus-confined spaces and for identifying any confined space hazards prior to entry into a confined space. The Contractor is responsible for ensuring his/her workers and Subcontractors are adequately trained in confined space entry procedures in accordance with OSHA 1910.146, Permit Required Confined Spaces for General Industry.

The Contractor will provide the Contract Administrator with a written copy of their Confined Space Entry Plan (CSEP) for review and approval at least 5 working days in advance of the planned entry. Prior to work commencements, the Contractor will also certify in writing that all of his/her workers and Subcontractors have been trained in accordance with OSHA 1910.146, Permit Required Confined Spaces for General Industry. This certification will list all employees working on campus by name and social security number.

If the Contractor’s CSEP is approved, the Contractor may utilize his/her CSEP for entering into campus confined spaces. If disapproved, or if the Contractor does not have a written CSEP, the Contractor will comply with the University’s CSEP. Until such time as the Contractor provides written certification that all of his/her employees and Subcontractor employees working on campus have been adequately trained in confined space entry procedures, entry in TU confined spaces is strictly forbidden. Questions concerning TU CSEP should be directed to EHS.

The Contractor assumes all responsibility for any work delays associated with noncompliance with confined space regulations.

8. Respiratory Protection
The Contractor agrees to comply with all local, state and federal regulations pertaining to the use of respiratory protection equipment. It is the Contractor’s responsibility to ensure their workers are provided and wearing the appropriate respiratory protection device suitable to the hazard.

The Contractor will provide the Contract Administrator with a written copy of their Respiratory Protection Plan (RPP) for review and approval at least 5 workdays in advance of the planned entry. If approved, the Contractor may utilize his/her RPP while on campus. If disapproved, or if the Contractor does not have a written RPP, the Contractor will comply with the University’s RPP. Questions concerning TU RPP should be directed to EHS at 410-704-2949.

The Contractor assumes all responsibility for any work delays associated with noncompliance with respiratory protection regulations.

9. Waste Disposal
The Contractor is responsible for the removal and disposal of all non-hazardous waste products generated from his/her work on campus. All non-hazardous waste materials generated by the Contractor shall be removed from campus (unless otherwise specified) and disposed of in accordance with all applicable federal, state and county laws and regulations. The University reserves the right to require the use of a TU Non-Hazardous Waste Manifest for transport off campus of any University non-hazardous waste. The University also reserves the right to approve or disapprove the facility(ies) the Contractor utilizes for disposal of any University non-hazardous wastes (as necessary). All costs will be borne by the Contractor for the disposal of all hazardous or non-hazardous wastes, unless otherwise specified in the contract.

Under no circumstances is any Contractor’s generated hazardous waste to be disposed of on campus. The Contractor is responsible for the removal and proper disposal of all his/her hazardous waste, in accordance with all applicable federal, state and county laws and regulations. Contractor’s generated hazardous waste is waste resulting from their operations/equipment on campus when using Contractor owned/supplied materials/chemicals. Disposal costs for this will be borne solely by the Contractor.

The University routinely performs wastewater monitoring in accordance with its Industrial Wastewater Discharge Permit and routinely screens campus discharges for hazardous wastes. The Contractor will be held liable for any assessed penalties attributable to the improper discharge of hazardous wastes from campus facilities.

Contracts that require Contractors to transport and/or dispose of regulated hazardous materials (i.e., hazardous wastes) owned and/or generated by Towson University will be disposed of by Towson University Environmental Health & Safety utilizing existing University hazardous waste disposal contractors. The Contractor should contact EHS as soon as the hazardous wastes have been identified to coordinate the disposal.
All transportation and disposal costs will be paid by Towson University and then back charged to the Contractor.

Any questions concerning the disposal of hazardous or non-hazardous waste should be directed to EHS at 410-704-2949.

10. The Control of Hazardous Energy Source (Lock Out/Tag Out)

The Contractor agrees to comply with all local, state and federal regulations pertaining to the control of hazardous energy sources. The Contractor is responsible for insuring his/her workers and any Subcontractors are adequately trained in Lockout/Tagout procedures in accordance with OSHA 1910.147, The Control of Hazardous Energy Sources (Lock Out/Tag Out).

The Contractor will provide the Contract Administrator with a written copy of their Lock Out/Tag Out policy (LO/TO) and/or procedures for review and approval at least five (5) working days in advance of the commencement date of the contract. Prior to work commencement, the Contractor will also certify in writing that all of his/her workers and Subcontractors have been trained in accordance with OSHA 1910.147. This certification will list all employees working on campus by name and social security number.

If the Contractor’s LO/TO is approved, the Contractor may utilize their LO/TO for work on hazardous energy sources. If disapproved, or if the Contractor does not have a written LO/TO, the Contractor will comply with TU LO/TO Policy/Procedures. Until such time as the Contractor provides written certification that all his/her employees and Subcontractors working on campus have been adequately trained in LO/TO procedures, work on hazardous energy sources is strictly forbidden. Questions concerning TU LO/TO Policy/Procedures shall be directed to EHS at 410-704-2949.

The Contractor assumes all responsibility for any work delays associated with noncompliance with the control of Hazardous Energy Sources regulations.

11. Wastewater/Sewer Discharge

The University’s Wastewater Discharge Permit strictly prohibits the disposal of waste chemicals and corrosives via the sanitary sewer system. NO waste chemicals (i.e., old, unused, excess, etc.), including, but not limited to, organic solvents and/or corrosives (pH less than or equal to 6 and greater than or equal to 10) will be disposed of on campus via the sanitary sewer system without advance written approval of the TU Department of Environmental Health & Safety (EHS). The Contractor shall submit MSDS’s for all waste chemicals they wish to dispose of in the sanitary sewer to EHS five (5) working days in advance for approval.

The University routinely performs wastewater monitoring in accordance with its Industrial Wastewater Discharge Permit and routinely screens campus discharges for waste chemicals and corrosives. The Contractor will be held liable for any assessed penalties attributable to the improper discharge of these materials from campus facilities.

The Contractor is subject to unannounced inspections of the chemicals their employees are using on campus. TU Department of Environmental Health & Safety will conduct these unannounced inspections.

12. Safety Training/Inspections/Meetings

The Contractor is responsible to notify the Contract Administrator five (5) working days in advance of the date, time and location of their monthly safety meeting.

13. Materials

No asbestos, lead, or PCB containing materials (0%) are to be utilized /installed on campus unless prior written approval has been received from the University’s Department of Environmental Health & Safety (410-704-2949).

14. Stormwater Pollution Prevention/Prohibition of Illicit Discharges

No person shall cause or contribute discharge directly or indirectly into the Towson University municipal storm drain system or waterways any materials, including but not limited to pollutants or waters containing any pollutants that cause or contribute to a violation of applicable water quality standards, other than storm water.

Refer to 06-20.00 – University Policy on Stormwater Illicit Discharge Detection and Elimination for additional information.

No person may improperly store, handle, use or apply any pollutant in a manner that will cause its exposure to rainfall, runoff and discharge into the Towson University municipal stormwater drain system or campus waterways.

The commencement, conduct or continuance of any illegal discharge to the storm drain system is prohibited except as described:

a. The following discharges are exempt from discharge prohibitions:
   - water line flushing or other potable water sources, landscape irrigation or lawn watering, diverted stream flows, rising ground water, ground water infiltration to storm drains, uncontaminated pumped ground water, foundation or footing drains (not including active groundwater dewatering systems), crawl space pumps, air conditioning condensation, springs, non-commercial washing of vehicles, natural riparian habitat or wet-land flows, swimming pools (if dechlorinated - typically less than one PPM chlorine), fire-fighting activities, and any other water source not containing pollutants.

b. Any discharges specified in writing by Towson University Environmental Health & Safety as being necessary to protect public health and safety.

c. Dye testing only with required verbal notification to Towson University Environmental Health & Safety ([410] 704-2949 or safety@towson.edu) prior to the time of the test.

d. The following discharges are exempt from discharge prohibitions:
   - water line flushing or other potable water sources, landscape irrigation or lawn watering, diverted stream flows, rising ground water, ground water infiltration to storm drains, uncontaminated pumped ground water, foundation or footing drains (not including active groundwater dewatering systems), crawl space pumps, air conditioning condensation, springs, non-commercial washing of vehicles, natural riparian habitat or wet-land flows, swimming pools (if dechlorinated - typically less than one PPM chlorine), fire-fighting activities, and any other water source not containing pollutants.

15. Prohibition of Illicit Connections

The construction, use, maintenance or continued existence of illicit connections to the storm drain system is prohibited. This prohibition expressly includes, without limitation, any illicit connections made in the past. This is regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection. A person is considered to be in violation if the person connects a line conveying sewage to the MS4, or allows such a connection to continue.
16. Notification of Spills or Illicit Discharges
Notwithstanding other requirements by law, as soon as any contractor has information regarding any known or suspected release of materials that result or may result in illegal discharges or pollutants discharging into storm water, the storm drain system, campus waterways, said person shall take all necessary steps to ensure the discovery, immediate containment, and cleanup of such release. **In the event of a release of hazardous materials or upon observing an illicit environmental discharge immediately contact the Towson University Police Department (TUPD) at (410) 704-4444.** In the event of a release of non-hazardous materials, notify Towson University Environmental Health & Safety in person or by phone [(410) 704-2949] or e-mail [safety@towson.edu] no later than the next business day. Notifications in person or by phone shall be confirmed by written notice addressed and mailed to Environmental Health & Safety, Towson University, 8000 York Road, Towson, MD 21252 within three business days of the phone notice.

17. Enforcement

a. Enforcement for student violators will follow the TU Office of Student Conduct and Civility Education Code of Student Conduct.

b. Enforcement for University employees (Faculty and Staff) shall follow the Towson University Policy for discipline or termination Policy No. 07.05.25 – Disciplinary Action for Employees.

c. Enforcement for Visitors (Non-TU Faculty, Staff, Students or Contractors)

d. Individuals or Contractors, depending on the nature and severity of the violation, may be referred to MDE for prosecution for violation of federal and state laws and regulations.

e. Any fines, penalties, environmental monitoring or remediation expenses, etc., resulting from the illicit discharge, will be violator’s responsibility.

f. During normal University business hours (Monday-Friday, 8am-4pm), contact EHS at (410) 704-2949 to report violations.

g. If the violator is still on the scene, they should also immediately contact TUPD at (410) 704-4444.

h. After normal duty hours, weekends and holidays, contact TUPD at (410) 704-4444 to report violations.
EXHIBIT A-2
REQUIRED CONTRACT PROVISIONS
CONSTRUCTION AND MAINTENANCE

The provisions contained in this exhibit will be incorporated and be a part of the contract entered into between Towson University and any contractors as a result of this procurement.

1. Affirmation - Contingent Fees
The Contractor shall submit with its bid/proposal a Procurement Affirmation regarding contingent fees in the form required by USM Procurement Policies and Procedures.

2. Affirmation - Debarment
The Contractor shall submit with its bid/proposal a Procurement Affirmation in the form required by USM Procurement Policies and Procedures.

3. Affirmation Regarding Debarment of Related Entities
The Contractor shall submit with its bid/proposal a Procurement Affirmation regarding debarment of related entities in the form required by USM Procurement Policies and Procedures.

4. Affirmation - Non-Collusion
The Contractor shall submit with its bid/proposal a Non-Collusion Affirmation in the form required by USM Procurement Policies and Procedures.

5. Affirmation Regarding Bribery Convictions
The offeror warrants that neither it nor any of its officer, directors, or partners nor any of its employees who are directly involved in obtaining or performing contracts with any public body has been convicted of bribery, attempted bribery, or conspiracy to bribe under the laws of any state or of the federal government or has engaged in conduct since July 1, 1977, which would constitute bribery, attempted bribery, or conspiracy to bribe under the laws of any state or the federal government.

The Contractor shall submit with its bid/proposal a Procurement Affirmation regarding bribery convictions in the form required by University System of Maryland (USM) Procurement Policies and Procedures.

6. Affirmation Regarding Other Convictions
The Contractor shall submit with its bid/proposal a Procurement Affirmation regarding other convictions in the form required by USM Procurement Policies and Procedures.

7. Affirmation Regarding Sub-Contractors
The Contractor shall submit with its bid/proposal a Procurement Affirmation regarding debarment of sub-contractors in the form required by USM Procurement Policies and Procedures.

8. Affirmation - Drug and Alcohol Free Workplace
The contractor warrants that the contractor shall comply with COMAR 21.11.08 Drug and Alcohol Free Workplace, and that the contractor shall remain in compliance throughout the term of this contract.

9. Certification of Corporation Registration and Tax Payment
The Contractor shall submit with its bid/proposal a Procurement Affirmation regarding certification of corporation registration and tax payment in the form required by USM Procurement Policies and Procedures.

10. Affirmation - Financial Disclosure
The Contractor shall submit with its bid/proposal a Financial Disclosure Affirmation in the form required by USM Procurement Policies and Procedures.

11. Affirmation - Political Contribution Disclosure
The Contractor shall submit with its bid/proposal a Political Contribution Disclosure Affirmation in the form required by USM Procurement Policies and Procedures.

12. Contract Affidavit
The successful bidder shall submit, prior to contract award, a Contract Affidavit in the form required by USM Procurement Policies and Procedures.

13. Affirmative Action
The Contractor and all subcontractors shall develop and maintain affirmative action plans directed at increasing the utilization of women and members of minority groups on State public works projects, pursuant to the Executive Order 11246 of the President of the United States of America and guidelines on Affirmative Action issued by the Equal Employment Opportunities Commission (EEOC) 29 C.F.R. part 1608 and the Governor of Maryland's Executive Order 01.01.1993.16.

14. Amendments and Modifications
The contract documents, as defined within the contract, constitute the entire agreement between the parties hereto. All other communications between the parties prior to execution of the contract, whether written or oral, with reference to the subject matter of the contract are superseded by the agreement contained therein. No amendment of this contract shall be binding unless in writing and signed by the parties. Amendments may not significantly change the scope of the contract.

15. Civil Rights Act of 1964
Contractors providing materials, equipment, supplies or services to the State under the contract herewith assure the State that they are conforming to the Civil Rights Act of 1964, the Civil Rights Restoration Act of 1988, the Civil Rights Act of 1991, and Section 202 of Executive Order 11246 of the President of the United States of America as amended by Executive Order 11375, as applicable.

16. Compliance with Laws
The Contractor hereby represents and warrants that:

a. It is qualified to do business in the State of Maryland, and that it will take such action, as from time to time hereafter, may be necessary to remain so qualified;

b. It is not in arrears with respect to the payment of any monies and owing the State of Maryland, or any department or agency thereof, including but not limited to the payment of taxes and employee benefits, and that it shall not become so in arrears during the term of the contract;

c. It shall comply with all federal, State and local laws, ordinances applicable to its activities and obligations under the contract; and;
d. It shall procure, at its expense, all licenses, permits, insurance and governmental approval, if any, necessary to the performance of its obligations under the contract.

17. Compensation and Method of Payment
Contractor agrees to include on the face of all invoices billed to the University, its Taxpayer Identification Number, which is the Social Security Number for individuals and sale proprietors and the Federal Employee Identification Number for all other types of organizations.

18. Confidentiality; dissemination of Information
Contractor shall not release any information related to services or performance of the services under this Contract, nor publish any final reports or documents without the prior written approval of the University. Contractor shall indemnify and hold harmless the State and the University, its officers, agents and employees from all harm which may be incurred by reason of dissemination, publication, distribution or circulation, in any manner whatsoever, of any information, data, documents, or materials pertaining in any way to this Contract by Contractor, its agents or employees.

19. Conflict of Interest Law
It is unlawful for any State officer, employee, or agent to participate personally in his official capacity through decision, approval, disapproval, recommendation, advice, or investigation in any contract or other matter in which he, his spouse, parent, child, brother, or sister has a financial interest or to which any firm, corporation, association, or other organization in which he has a financial interest or in which he is serving as an officer, director, trustee, partner, or employee, or any person or organization with whom he is negotiating or has any arrangement concerning prospective employment, is a party, unless such officer, employee, or agent has previously complied with the provisions of State Government Article § § 15-501 et seq. of the Annotated Code of Maryland.

20. Contract Modifications and Changes
a. The procurement officer unilaterally may, at any time, without notice to the sureties, if any, by written order designed or indicated to be a change order, make any change in work within the general scope of the contract, including but not limited to changes:
(1) In the specifications (including drawings and designs);
(2) In the method or manner of performance of the work;
(3) In the State-furnished facilities, equipment, materials, services, or site; or
(4) Directing acceleration in the performance of the work.

b. Any other written order or an oral order, including a direction, instruction, interpretation or determination, from the procurement officer that causes any such change, shall be treated as a change order under this clause, provided that the Contractor gives the procurement officer written notice stating the date, circumstances, and source of the order and that the Contractor regards the order as a change order.

c. Except as herein provided, no order, statement, or conduct of the procurement officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment hereunder.

d. Subject to paragraph f., if any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any order, an equitable adjustment shall be made and the contract modified in writing accordingly; provided, however, that except for claims based on defective specifications, no claim for any change under (b.) above shall be allowed for any costs incurred more than 20 days before the Contractor gives written notice as therein required; and provided further, that in the case of defective specifications for which the State is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with such defective specifications.

e. If the Contractor intends to assert a claim for an equitable adjustment under this clause, he shall, within 30 days after receipt of a written change order under a. above or the furnishing or written notice under b. above, submit to the procurement officer a written statement setting forth the general nature and monetary extent of such claim, unless this period is extended by the University. The statement of claim hereunder may be included in the notice under b. above.

f. Each contract modification or change order that affects contract price shall be subject to the prior written approval of the procurement officer and other appropriate authorities and to prior certification of the appropriate fiscal authority of fund availability and the effect of the modification or change order on the project budget or the total construction cost. If, according to the certification of the fiscal authority, the contract modification or change order will cause an increase in cost that will exceed budgeted and available funds, the modification or change order may not be made unless sufficient additional funds are made available or the scope of the project is adjusted to permit its completion within the project budget.

g. No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under the contract.

21. Contractor's On-Site Representative
The Contractor is required to maintain on site at all times when the work is in progress on this project an individual who represents the Contractor, is responsible for the entire project, and can communicate in English with the University's representative.

22. Contractor's Invoices
Contractor shall include its Taxpayer Identification Number on the face of each invoice billed to the University. If a Purchase Order document is issued, the Purchase Order Number must be included.

23. Cooperation with University and State Representatives
Before any of the work shall begin, the Contractor shall confer with the University's representative at the site and agree on a sequence of procedure, means of access to the premises, space for storage of materials and equipment, use of approaches, use of facilities, etc.

24. Cost and Price Certification
The Contractor, by submitting cost or price information certifies that, to the best of its knowledge, the information submitted is accurate, complete, and current as of a mutually determined specified date prior to the conclusion of any price discussions or negotiations for:

a. A negotiated contact, if the total contract price is expected to exceed $100,000 or a smaller amount set by the procurement officer; or

b. A change order or contract modification, expected to exceed $100,000 or a smaller amount set by the procurement officer.

c. The price under this contract and any change order or modification hereunder, including profit or fee, shall be adjusted to exclude any significant price increases occurring because the Contractor furnished cost or price information which, as of the date agreed upon between the parties, was inaccurate, incomplete, or not current.

25. Default Delay and Time Extension
Termination for Default — Damages for Delay — Time Extensions

(1) If the Contractor refuses or fails to prosecute the work, or any separable part thereof, with such diligence as shall insure its completion within the time specified in this contract, or any extension thereof, or fails to complete said work within this time, the State may, by written notice to the Contractor, terminate his right to proceed with the work or the part of the work as to which there has been delay. In this event the State may take over the work and prosecute the same to completion, by contract or otherwise, and may take possession of and
utilize in completing the work the materials, appliances, and plant as may be on the site of the work and necessary therefor. Whether or not the Contractor’s right to proceed with the work is terminated, he and his sureties shall be liable for any damage to the State resulting from his refusal or failure to complete the work within the specified time.

(2) If fixed and agreed liquidated damages are provided in the contract and if the State so terminates the Contractor’s right to proceed, the resulting damage shall consist of such liquidated damages until a reasonable time as may be required for final completion of the work together with any increased costs occasioned the State in completing the work.

(3) If fixed and agreed liquidated damages are provided in the contract and if the State does not so terminate the Contractor’s right to proceed, the resulting damage shall consist of these liquidated damages until the work is completed or accepted.

(4) The Contractor’s right to proceed may not be so terminated nor the contractor charged with resulting damages if:

(a) The delay in the completion of the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, acts of the public enemy, acts of the State in either its sovereign or contractual capacity, acts of another Contractor in the performance of a contract with the State, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather, or delays of subcontractors or suppliers arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and the subcontractors or suppliers; and

(b) The Contractor, within 10 days from the beginning of any such delay (unless the procurement officer grants a further period of time before the date of final payment under the contract), notifies the procurement officer in writing of the causes of delay. The procurement officer shall ascertain the facts and the extent of the delay and extend the time for completing the work when, in his judgement, the findings of fact justify such an extension, and his findings of fact shall be final and conclusive on the parties, subject only to appeal as provided in the “Disputes” clause of this contract.

(5) If, after notice of termination of the Contractor’s right to proceed under the provisions of this clause, it is determined for any reason that the Contractor was not in default under the provisions of this clause, or that the delay was excusable under the provisions of this clause, the rights and obligations of the parties shall, if the contract contains a clause providing for termination for convenience of the State, be the same as if the notice of termination had been issued pursuant to the clause. If, in the foregoing circumstances, this contract does not contain a clause providing for termination for convenience of the State, the contractor shall be equitably adjusted to compensate for the termination and the contract modified accordingly; failure to agree to any such adjustment shall be a dispute concerning a question of fact within the meaning of the clause of this contract entitled “Disputes”.

(6) The rights and remedies of the State provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

(7) As used in paragraph (4)(a) of this clause, the term “subcontractors or suppliers” means subcontractors or suppliers at any tier.

26. Delivery and Acceptance

Delivery shall be made in accordance with the specifications. The University reserves the right to test any materials, equipment, supplies, or services delivered to determine if the specifications have been met. The materials listed in the specifications shall be delivered FOB the point or points specified prior to or on the date specified in the solicitation. Any material that is defective or fails to meet the terms of the specifications may be rejected. Rejected materials shall be promptly replaced. The State reserves the right to purchase replacement materials in the open market. Vendors failing to promptly replace materials lawfully rejected shall be liable for any excess price paid for the replacement, plus applicable expenses, if any.

27. Disputes

a. This contract is subject to the USM Procurement Policies and Procedures.

b. Except as otherwise provided in this contract or by law, all disputes arising under or as a result of a breach of this contract that are not disposed of by mutual agreement shall be resolved in accordance with this clause.

c. As used herein, claim means a written demand or assertion by one of the parties seeking, as a legal right, the payment of money, adjustment or interpretation of contract terms, or other relief, arising under or relating to this contract. A voucher, invoice, or request for payment that is not in dispute when submitted is not a claim under this clause. However, if the submission subsequently is not acted upon in a reasonable time, or is disputed as to liability or amount, it may be converted to a claim for the purpose of this clause.

d. Within 30 days after contractor knows or should have known of the basis for a claim relating to this contract, contractor shall file a written notice of claim with the procurement officer.

e. Contemporaneously with, or within 30 days after, the filing of a notice of claim, contractor shall submit the written claim to the procurement officer. If contractor so requests, the procurement officer, on conditions the procurement officer deems satisfactory to the unit, may extend the time in which contractor must submit the claim. An example of when a procurement officer may grant an extension includes situations in which the procurement officer finds that a contemporaneous or timely cost quantification following the filing of the notice of claim is impossible or impractical.

f. The claim shall set forth all the facts surrounding the controversy. Contractor, at the discretion of the procurement officer, may be afforded an opportunity to be heard and to offer evidence in support of the claim.

g. The procurement officer shall mail or deliver written notification of the final decision within:

(1) 90 days after the procurement officer receives the claim if the claim is an amount for which the Appeals Board accelerated procedure, set forth in COMAR 21.10.06.12, may be used;

(2) 180 days after the procurement officer receives the claim for a claim not covered under §G(1) of this regulation; or

(3) A longer period that the procurement officer and contractor agree to in writing.

h. The final decision may award a contract claim only for those expenses incurred not more than 30 days before contractor was initially required to have filed the notice of claim.

i. The procurement officer’s decision is the final action of the University. If the procurement officer fails to render a final decision within the time required, contractor may deem the failure to be a final decision not to pay the claim.

j. If the final decision grants the claim in part and denies the claim in part, the University shall pay contractor the undisputed amount. Payment of the partial claim is not an admission of liability by the University and does not preclude the University from recovering the amount paid if a subsequent determination modifies the final decision.

k. Contractor may file a written appeal with the Maryland State Board of Contract Appeals within 30 days of receipt of notice of the decision.
i. Pending resolution of a claim, contractor shall proceed diligently with the performance of the contract in accordance with the procurement officer’s decision.

26. Dissemination of Information
a. During the term of the contract, the Contractor shall not release any information related to the services or performance of the services under the contract nor publish any final reports or documents without the prior written approval of the University.

b. The Contractor shall indemnify and hold harmless the State and the University, its officers, agents and employees, from all liability which may be incurred by reason of dissemination, publication, distribution or circulation, in any manner whatsoever, of any information, data, documents, or materials pertaining in any way to the contract by the Contractor, its agents or employees.

29. EPA Compliance
Materials, supplies, equipment and services shall comply in all respects with the federal Noise Control Act of 1972, where applicable. Power equipment, to the greatest extent possible, shall be the quietest available. Equipment certified by the US EPA as a Low Noise Emission Product pursuant to the Federal Noise Control Act of 1972 shall be considered to meet the intent of the regulation.

The Contractor must supply and have immediately available to their employees spill containment equipment/supplies necessary to contain any hazards it may introduce to the job site. The Contractor is responsible for any and all costs incurred by the University in remediating spills or releases of materials introduced onto the job site.

Depending on the nature of the contract, the additional environmental and safety provisions contained in Exhibit A-1 may also be required.

30. FERPA
The Parties agree to maintain the privacy and security of personally identifiable educational records and health information and to prevent disclosure in compliance with Federal laws.

The Contractor agrees that in performing its obligations under this contract, the Contractor shall comply with all requirements of a non-affiliated third-party who receives a financial institution’s consumer or customer information, under the Gramm-Leach-Bliley Act of 1999 and applicable regulations thereto (the “GLB Act”) and other applicable federal and state consumer privacy acts, rules and regulations. Nonpublic personal information shall have the same meaning as that term is defined in the GLB Act.

a. The Contractor agrees to disclose such nonpublic personal information for the sole purpose of facilitating the Contractor’s performance of its duties and obligations under the contract and will not disclose such nonpublic personal information to any other party unless such disclosure is (i) allowed by the GLB Act and consented to by the University, or (ii) compelled by law, in which case the Contractor will provide notice of such disclosure to the University.

b. The Contractor represents and warrants that it will, for so long as it retains nonpublic personal information, implement and maintain in place the necessary information security policies and procedures for (i) protecting the confidentiality of such nonpublic personal information, (ii) protecting against any anticipated threats or hazards to the security or integrity of such nonpublic personal information, and (iii) protecting against the unauthorized access to or use of such nonpublic personal information. These terms apply to all subcontractors employed by the Contractor who perform work under the scope of the agreement.

If the Contractor’s price includes the cost of Contractor furnishing any other material, equipment, supplies, or other items in connection with the Contract, the Contractor shall pay the Maryland sales tax.

32. Incorporation by Reference
The terms of this solicitation and any amendments thereto are made a part of this Contract.

33. Indemnification
The University shall not assume any obligation to indemnify, hold harmless, or pay attorneys’ fees that may arise from or in any way be associated with the performance or operation of this agreement.

34. Inspection by the University
The University may provide for inspection, at any time, of any part of the Contractor’s work, and of any of the materials, supplies or equipment which the Contractor may have on hand or in the building. The Contractor shall provide adequate cooperation with any inspector assigned by the University to permit the inspector to determine the Contractor’s conformity with these specifications and the adequacy of the work being performed.

35. Intellectual Property
Contractor agrees to indemnify and save harmless the University, its officers, agents and employees with respect to any claim, action, cost or judgment for patent infringement, or trademark or copyright violation arising out of purchase or use of materials, supplies, equipment or services covered by the contract.

36. I-9 Requirement
Contractor warrants and represents that it is currently in compliance, and that during the term of the contract it will remain in compliance, with the Immigration Reform and Control Act of 1986, and that it will obtain original valid employment verification documentation from all its employees on a timely basis as required by law and regulation. This requirement also applies to all subcontractors hired by Contractor.

37. Insurance and Indemnification Provisions
a. The Contractor shall defend, indemnify and save harmless the University System of Maryland, its officers, employees and agents, from any and all claims, liability, losses and causes of actions which may arise out of the performance by the Contractor, employees or agents, of the work covered by the contract.

b. The Contractor shall secure, pay the premiums for, and keep in force until the expiration of the contract, and any renewal thereof, adequate insurance as provided below, such insurance to specifically include liability assumed by the Contractor under the contract.

(1) Commercial General Liability Insurance including all extensions
   $2,000,000 each occurrence;
   $2,000,000 personal injury;
   $2,000,000 products/completed operations;
   $2,000,000 general aggregate

(2) Workmen’s Compensation Insurance and Unemployment Insurance as required by the laws of the State of Maryland.

(3) Owner’s, Landlord’s and Tenant’s and Contractor’s bodily injury liability insurance, with limits of not less than $500,000 for each person and $2,000,000 for each accident.

(4) Property damage liability insurance with a limit of not less than $2,000,000 for each accident.

(5) If automotive equipment is used in the operation, automobile bodily injury liability insurance with limits of not less than $1,000,000 for each person and $2,000,000 for each accident, and property damage liability insurance, with a limit of not less than $2,000,000 for each accident.

c. Each policy for liability protection, bodily injury or property damage must specifically name, on its face, the University System of Maryland as an additional named insured as respects operations under the contract and premises occupied by the Contractor provided, however,
with respect to the Contractor’s liability for bodily injury or property
damage under items b(1) b(6) above, such insurance shall cover and
not exclude Contractor’s liability for injury to the property of the
University System and to the persons or property of employees,
students, faculty members, agents, officers, regents, invitees or guests of
the University System.

d. Each insurance policy shall contain the following endorsements:
“it is understood and agreed that the Insurance Company shall notify
in writing procurement officer forty-five (45) days in advance of the
effective date of any reduction in or cancellation of this policy.” A
certificate of each policy of insurance shall be furnished to the
procurement officer. With the exception of Workmen’s Compensation,
upon the request of the procurement officer, a certified true copy of
each policy of insurance, including the above endorsement, manually
countersigned by an authorized representative of the insurance
company, shall be furnished to the procurement officer. A certificate of
insurance for Workmen’s Compensation together with a properly
executed endorsement for cancellation notice shall also be furnished.
Following the notice of contract award, the requested certificates and
policies shall be delivered as directed by the procurement officer.
Notices of policy changes shall be furnished to the procurement officer.

e. All required insurance coverages must be acquired from insurers
authorized to do business in the State of Maryland and acceptable to
the University. The insurer must have a policyholders’ rating of “A-”
or better, and a financial size of “Class VII” or better in the latest edition
of Best’s Insurance Reports.

38. Fire and Extended Coverage Insurance

a. Contractor shall carry, at its own expense, builder's risk insurance
for the full contract amount, insuring against the perils of fire, lightning,
extended coverage vandalism, and malicious mischief subject only to
the minimum standard deductible currently filed by the Insurance
Service Office with the State of Maryland Insurance Department. The
University will provide no coverage during the construction period.

b. The builder’s risk policy shall contain endorsements reading as follows:

1. It is the intent of this insurance to cover specifically all the Work
being done under the Contract between the insureds, and as to such
Work this policy shall be primary insurance and shall not contribute or
claim contribution from any other insurance being carried which, by its
terms, would also cover the property covered hereunder in the absence
of this insurance.

2. Coverage afforded under this policy will not be canceled until at
least fifteen (15) days prior written notice has been given to the
Procurement Officer.

c. Certificates of insurance shall be submitted to the Procurement
Officer for review and approval prior to commencement of work, and
shall be held for the duration of the contract. The University shall have
the absolute right to terminate the contract if the policy of insurance is
canceled at any time for any reason and a new policy is not obtained
by Contractor and approved by the Procurement Officer.

d. The above insurance shall remain in full force and effect until such
time as the University shall fully accept the work covered by this
contract.

39. Liquidated Damages

Time is an essential element of the contract and it is important that the
work be vigorously prosecuted until completion.

For each day that any work shall remain uncompleted beyond the
time(s) specified elsewhere in the contract, the Contractor shall be
liable for liquidated damages in the amount(s) provided for in the
solicitation, provided, however, that due account shall be taken of any
adjustment of specified completion time(s) for completion of work as
granted by approved change orders.

40. Local Conditions Covering Work

The Contractor shall cooperate with those in authority on the premises
prevent the entrance and exit of all workmen and/or others whose
presence is forbidden or undesirable and in bringing, storing or removal
of all materials and equipment, to observe all rules and regulations in
force on the grounds, to avoid unnecessary dust or accumulated debris
or the undue interference with the convenience, sanitation or routine of
the University and to prevent the loss of, or damage to the property
of the University and/or its employees. The Contractor shall repair any
and all damage he may cause to the building or property, to the full
satisfaction of the University.

41. Mandated Contractor Reporting of Suspected Child Abuse &
Neglect

Maryland law contains mandatory reporting requirements for all
individuals who suspect child abuse or neglect. Contractors performing
work on campus also must comply with USM Board of Regents (BOR)
VI-1.50 – Policy on the Reporting of Suspected Child Abuse & Neglect,
as well as the University Procedures for Reporting Suspected Child
Abuse and Neglect. The above-referenced USM/University Policy and
Procedures are available in full at the following link:
https://inside.towson.edu/generalcampus/tupolicies/documents/06-
01.50%20Policy%20on%20the%20Reporting%20of%20Suspected-
Child%20Abuse%20and%20Neglect.pdf, and are incorporated
herein. The University reserves the right to terminate the contract if
Contractor fails to comply with the above-referenced policy or
procedures, or if, in the judgment of the University, termination is
necessary to protect the safety and welfare of children who come into
contact with the University community.

42. Maryland Law Preval

The contract shall be governed by the laws of the State of Maryland.
The parties agree that exclusive jurisdiction shall reside with the state
and federal courts in the State of Maryland.

43. Non-Hiring of Employees

No employee of the State of Maryland, or any department, commission,
agency or branch thereof whose duties as such employee include
matters relating to or affecting the subject matter of the contract, shall,
while so employed, become or be an employee of the party or parties
hereby contracting with the State or any department, commission,
agency or branch thereof.

44. Non-Discrimination

The Contractor will comply with all applicable Federal and State laws,
rules and regulations involving non-discrimination on the basis of race,
color, creed, religion, national origin, age, sex, political affiliation,
marital status, veteran status, condition of disability, or other non-merit
factor. In addition, Towson University’s policies, programs, and
activities comply with federal and state laws and University System of
Maryland regulations prohibiting discrimination on the basis of race,
color, religion, age, national origin, sex, disability, and sexual
orientation. Provisions for reasonable accommodations shall be made
by the Contractor for handicapped applicants and qualified
handicapped individuals.

45. Non-Visual Access

The bidder or offeror warrants that the information technology offered
under this bid or proposal (1) provides equivalent access for effective
use by both visual and nonvisual means; (2) will present information,
including prompts used for interactive communications, in formats
intended for both visual and nonvisual use; (3) if intended for use in a
network, can be integrated into networks for ob

For purposes of this section, the phrase “equivalent access” means that the ability to receive, use and manipulate information and operate controls necessary to access and use information technology by nonvisual means. Examples of equivalent access include keyboard controls used for input and synthesized speech, Braille, or other audible or tactile means used for output.

46. Ownership of Documents and Materials
The Contractor agrees that all documents and materials including, but not limited to, reports, drawings, studies, specifications, estimates, maps, photographs, designs, graphics, mechanical, artwork, and computations prepared by or for it under the terms of the contract shall at anytime during the performance of the services be made available to the University upon request by the University and shall become and remain the exclusive property of the University upon termination or completion of the services. The University shall have the right to use same without restriction or limitation and without compensation to the Contractor other than that provided by the contract. The University shall be the owner for purposes of copyright, patent or trademark registration.

47. Patents, Copyrights and Trade Secrets
a. If the Contractor furnishes any design, device, material, process or other item which is covered by a patent or copyright which is proprietary to or a trade secret of another, Contractor shall obtain the necessary permission or license to use such item.

b. Contractor will defend or settle, at its own expense, any claim or suit against the State alleging that any such item furnished by Contractor infringes any patent, trademark, copyright, or trade secret. Contractor also will pay all damages and costs that by final judgment may be assessed against the State due to such infringement and all attorneys’ fees and litigation expenses reasonably incurred by the State to defend against such a claim or suit. The obligations of this paragraph are in addition to those stated in paragraph c.

c. If any products furnished by Contractor become, or in Contractor’s opinion are likely to become, the subject of a claim of infringement, Contractor will, at its option: (1) procure for the State the right to continue using the applicable item; (2) replace the product with a non-infringing product substantially complying with the item’s specifications; or (3) modify the item so it becomes non-infringing and performs in a substantially similar manner to the original item.

48. Payment Bond
A payment bond is required for all construction contracts in excess of $100,000 in the amount equal to at least 100 percent of the contract price. The payment bond shall be delivered by the contractor to the State not later than the time the contract is executed. If a contractor fails to deliver the required payment bond, the contractor’s bid shall be rejected, its bid security shall be enforced, and award of the contract shall be made to the next lowest responsive and responsible bidder.

The required payment bond shall be in the State of Maryland form in effect at the time the contract is executed per COMAR 21.07.02.10B.

49. Performance Bond
A performance bond is required for all construction contracts in excess of $100,000 in the amount equal to at least 100 percent of the contract price. The performance bond shall be delivered by the contractor to the University not later than the time the contract is executed. If a contractor fails to deliver the required performance bond, the contractor’s bid shall be rejected, its bid security shall be enforced, and award of the contract may be made to the next lowest responsive and responsible bidder.

The required performance bond shall be in the State of Maryland form in effect at the time the contract is executed per COMAR 21.07.02.10A.

50. Payment of State Obligations
Payments to the Contractor pursuant to this contract shall be made no later than 30 days after the University’s receipt of a proper invoice from the Contractor. Charges of late payment of invoices, other than as prescribed by Title 15, subtitle 1, of the State Finance and Procurement Article, Annotated Code of Maryland, or by the Public Service Commission of Maryland with respect to regulated public utilities, as applicable, are prohibited.

51. Policies and Procedures
The USM Procurement Policies and Procedures in effect on the date of execution of this Contract are applicable to this Contract.

52. Responsibility of Contractor
a. The Contractor shall perform the services with that standard of care, skill, and diligence normally provided by a Contractor in the performance of services similar to the services hereunder.

b. Notwithstanding any review, approval, acceptance or payment for the services by the University, the Contractor shall be responsible for professional and technical accuracy of its work, design drawings, specifications and other materials furnished by the Contractor under the contract.

53. Prompt Payment of Subcontractors
a. This contract and all subcontracts issued under this contract are subject to the provisions of State Finance and Procurement Article, §15-226, Annotated Code of Maryland. References to “undisputed amount”, “prime contractor”, “contractor” and “subcontractor” have the meanings stated in Section 6.2 a-d herein have the meanings state in COMAR 21.10.08.01.

b. A contractor shall promptly pay its subcontractors an undisputed amount to which a subcontractor is entitled for work performed under this contract within 10 calendar days after the contractor receives a progress payment or final payment for work under this contract.

c. If a contractor fails to make payment within the period prescribed in b., a subcontractor may request a remedy in accordance with COMAR 21.10.08.

d. A contractor shall include in its subcontracts for work under the contract, wording that incorporates the provisions, duties, and obligations of 6.1 a-d; State Finance and Procurement Article, §15-226, Annotated Code of Maryland; and COMAR 21.10.08.

54. Responsibility for Claims and Liability
The Contractor shall be responsible for all damage to life and property due to its activities or those of its agents or employees, in connection with the services required under the contract. Further, it is expressly understood that the Contractor shall indemnify and save harmless the University, its officers, agents, and employees from and against all claims, suits, judgments, expenses, actions, damages and costs of every name and description, including reasonable attorney’s fees and litigation expenses arising out of or resulting from the negligent performance of the services of the Contractor under the contract.

55. Responsibility for Damage
a. The Contractor shall repair and restore to its original condition any equipment, materials or surfaces damaged by its operations.

b. The Contractor shall be entirely responsible for any loss or damage to its own materials, supplies, and equipment, and to the personal property of its employees while they are in the building.

c. The Contractor shall be solely responsible for any damage to the building or its contents for any loss or damage to any property belonging to the University or the University employees when such loss or damage may be attributable to their actions or negligence or the actions or negligence of their employees.
66. **Retainage**

a. This section shall apply if the contractor has furnished 100 percent payment security and 100 percent performance security. The contractor and each subcontractor at any tier shall incorporate the mandatory provisions outlined below in paragraphs b. through d. of this section, into each subcontract for work related to this contract.

b. The contractor may not retain from any payment due a subcontractor a percent of the payment greater than the percent for retainage specified in the contract.

c. A subcontractor at any tier may not retain from any payment due a lower tier subcontractor a percent of the payment greater than the percent of payments retained from the subcontractor.

d. A contractor and a subcontractor are not prohibited, by this section from withholding an amount in addition to retainage if the contractor or subcontractor determines that a subcontractor’s performance under the subcontract provides reasonable grounds for withholding an additional amount.

57. **Retention of Records**

The Contractor shall retain and maintain all records and documents relating to the contract for a minimum period of four years after payment by the University of the final invoice and shall make them available for inspection and audit by the State of Maryland.

58. **Set-Off**

The University may deduct from and set off against any amounts due and payable to the Contractor any back-charges or damages sustained by the University by virtue of any breach of the contract by the Contractor or by virtue of the failure or refusal of the Contractor to perform the services or any part of the services in a satisfactory manner. Nothing herein shall be construed to relieve the Contractor of liability for additional costs resulting from a failure to satisfactorily perform the services.

59. **Site Investigation**

The Contractor acknowledges that he has investigated and satisfied himself as to the conditions affecting the work, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, river stages, tides or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment and facilities needed preliminary to and during prosecution of the work. The Contractor further acknowledges that he has satisfied himself as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the University, as well as from information presented by the drawings and specifications made a part of this contract. Any failure by the Contractor to acquaint himself with the available information may not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the work. The University assumes no responsibility for any conclusions or interpretations made by the Contractor on the basis of the information made available by the University.

60. **Software Contracts:**

As specifically provided by § 21-104, Commercial Law Article, Annotated Code of Maryland, the parties agree that this Agreement shall not be governed by the Uniform Computer Information Transactions Act (UCITA), Title 21 of the Commercial Law Article of the Annotated Code of Maryland, as amended from time to time. This Agreement shall be governed by the common law of Maryland relating to written agreements, as well as other statutory provisions, other than UCITA, which may apply, and shall be interpreted and enforced as if UCITA had never been adopted in Maryland.

Contractor agrees that as delivered to buyer, the software does not contain any program code, virus, worm, trap door, back door, timer or clock that would erase data or programming or otherwise cause the software to become inoperable, inaccessible, or incapable of being used in accordance with its user manuals, either automatically upon the occurrence of selected conditions, or manually on command of Contractor.

61. **Specifications**

All materials, equipment, supplies or services shall conform to Federal and State laws and regulations and to the specifications contained in the solicitation. No asbestos, lead, or PCB-containing materials (0%) are to be utilized/installed on campus unless prior written approval has been received from the University’s Department of Environmental Health & Safety (410-704-2949).

62. **Subcontracting or Assignment**

The benefits and obligations hereunder shall take effect and be binding upon the parties hereto and neither the contract nor the services to be performed hereunder shall be subcontracted, or assigned or otherwise disposed of, either in whole or in part, except with the prior written consent of the University.

63. **Suspension of Work**

The procurement officer unilaterally may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as he may determine to be appropriate for the convenience of the University.

64. **Tax Exemption**

The State is generally exempt from federal excise taxes, Maryland sales and use taxes, District of Columbia sales taxes, and transportation taxes. Exemption certificates shall be provided upon request. Where a Contractor is required to furnish and install material in the construction of improvement to real property in performance of the Contract, the Contractor shall pay the Maryland sales tax and the exemption does not apply.

65. **Termination of Contract for Default**

If the Contractor fails to fulfill its obligation under the contract properly and on time, or otherwise violates any provision of the contract, the University may terminate the contract by written notice to the Contractor. The notice shall specify the acts or omissions relied on as cause for termination. All finished or unfinished services provided by the Contractor shall, at the University’s option, become the University’s property. The University shall pay the Contractor fair and equitable compensation for satisfactory performance prior to receipt of notice of termination, less the amount of damages caused by the Contractor’s breach. If the damages are more than the compensation payable to the Contractor, the Contractor will remain liable after termination and the University can affirmatively collect damages. The term "damages” as used in this paragraph may include attorney’s fees and litigation costs. Termination hereunder, including the determination of the rights and obligations of the parties, shall be governed by the provisions of USM Procurement Policies and Procedures.

66. **Termination of Contract for Convenience**

The performance of work under the contract may be terminated by the University in accordance with this clause in whole, or from time to time in part, whenever the University shall determine that such termination is in the best interest of the University. The University will pay all reasonable costs associated with the contract that the Contractor has incurred up to the date of termination and all reasonable costs associated with the termination of the contract. However, the Contractor shall not be reimbursed for any anticipated profits which have not been earned up to the date of termination. Termination hereunder, including the determination of the rights and obligations of the parties, shall be governed by the provisions of USM Procurement Policies and Procedures.
67. Termination of Multi-Year Contracts
If the General Assembly fails to appropriate funds or if funds are not otherwise made available for continued performance for any fiscal period of the contract succeeding the first fiscal period, the contract shall be canceled automatically as of the beginning of the fiscal year for which funds were not appropriated or otherwise made available; provided, however, that this will not affect either the State's rights or the Contractor's rights under any termination clause in the contract. The effect of termination of the contract hereunder will be to discharge both the Contractor and the State from future performance of the contract, but not from their rights and obligations existing at the time of termination. The Contractor shall be reimbursed for the reasonable value of any non-recurring costs incurred but not amortized in the price of the contract. The State will notify the Contractor as soon as it has knowledge that funds may not be available for the continuation of the contract for each succeeding fiscal period beyond the first.

68. Truth-In-Negotiation Certification
The Contractor by submitting cost or price information, including wage rates or other factual unit costs, certifies to the best of its knowledge, information and belief, that:

a. The wage rates and other factual unit costs supporting the firm's compensation, as set forth in the proposal, are accurate, complete and current as of the contract date;

b. If any of the items of compensation were increased due to the furnishing of inaccurate, incomplete or noncurrent wage rates or other units of costs, the State is entitled to an adjustment in all appropriate items of compensation, including profit or fee, to exclude any significant sum by which the price was increased because of the defective data. The State's right to adjustment includes the right to a price adjustment for defects in costs or pricing data submitted by a prospective or actual subcontractor; and

c. If additions are made to the original price of the contract, such additions may be adjusted to exclude any significant sums where it is determined the price has been increased due to inaccurate, incomplete or noncurrent wage rates and other factual costs."

69. Use of Contractor's Forms Not Binding on State
a. Except as provided in b., the use or execution by the State of any forms, orders, agreements, or other documents of any kind, other than the contract documents, used pursuant to or in the administration of any contract awarded by the State to Contractor, shall not bind the State to any of the terms and conditions contained therein except those provisions:

(1) generally describing, for the purposes of ordering: Equipment or services to be provided, locations, quantities, delivery or installation dates, and, to the extent consistent with the contract documents, prices; and

(2) not otherwise inconsistent with the contract documents.

b. Any such form, order, agreement or other document shall not vary, modify, or amend the terms and provisions of the contract documents, notwithstanding any provision to the contrary in such document, unless all of the following conditions are met:

(1) the document expressly refers to the particular document and provision of the contract documents being modified and plainly and conspicuously identifies any modification thereto as a modification:

(2) the document is executed on behalf of the State by the procurement officer; and

(3) execution of the document is approved by the procurement authority whose approval is required by law.

70. Variations in Estimated Quantities
Where the quantity of a pay item in this contract is an estimated quantity and where the actual quantity of such pay item varies more than twenty-five percent (25%) above or below the estimated quantity stated in this contract, an equitable adjustment in the contract price shall be made upon demand of either party. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above one hundred twenty-five percent (125%) or below seventy-five percent (75%) of the estimated quantity. If the quantity variation is such as to cause an increase in the time necessary for completion, the procurement officer shall, upon receipt of a written request for an extension of time within ten (10) days from the beginning of the delay, or within a further period of time which may be granted by the procurement officer before the date of final settlement of the contract, ascertain the facts and make the adjustment for extending the completion date as in his judgment the findings justify.
EXHIBIT B
BID/PROPOSAL AFFIDAVIT

A. AUTHORITY

I HEREBY AFFIRM THAT:

I am the (title) ____________________________ and the duly authorized representative of (business) ____________________________ and that I possess the legal authority to make this Affidavit on behalf of myself and the business for which I am acting.

B. AFFIRMATION REGARDING BRIBERY CONVICTIONS

I FURTHER AFFIRM THAT: Neither I, nor to the best of my knowledge, information, and belief, the above business (as is defined in Section 16-101(b) of the State Finance and Procurement Article of the Annotated Code of Maryland), or any of its officers, directors, partners, controlling stockholders, or any of its employees directly involved in the business's contracting activities including obtaining or performing contracts with public bodies has been convicted of, or has had probation before judgment imposed pursuant to Criminal Procedure Article, §6-220, Annotated Code of Maryland, or has pleaded nolo contendere to a charge of, bribery, attempted bribery, or conspiracy to bribe in violation of Maryland law, or of the law of any other state or federal law, except as follows (indicate the reasons why the affirmation cannot be given and list any conviction, plea, or imposition of probation before judgment with the date, court, official or administrative body, the sentence or disposition, the name(s) of person(s) involved, and current positions and responsibilities with the business):

_____________________________________

_____________________________________

_____________________________________ 

C. AFFIRMATION REGARDING OTHER CONVICTIONS RETAINED

I FURTHER AFFIRM THAT: Neither I, nor to the best of my knowledge, information, and belief, the above business, or any of its officers, directors, partners, controlling stockholders, or any of its employees directly involved in the business's contracting activities including obtaining or performing contracts with public bodies, has:

(1) Been convicted under state or federal statute of:

   (a) A criminal offense incident to obtaining, attempting to obtain, or performing a public or private contract; or

   (b) Fraud, embezzlement, theft, forgery, falsification or destruction of records or receiving stolen property;

(2) Been convicted of any criminal violation of a state or federal antitrust statute;

(3) Been convicted under the provisions of Title 18 of the United States Code for violation of the Racketeer Influenced and Corrupt Organization Act, 18 U.S.C. §1961 et seq., or the Mail Fraud Act, 18 U.S.C. §1341 et seq., for acts in connection with the submission of bids or proposals for a public or private contract;

(4) Been convicted of a violation of the State Minority Business Enterprise Law, §14-308 of the State Finance and Procurement Article of the Annotated Code of Maryland;
(5) Been convicted of a violation of §11-205.1 of the State Finance and Procurement Article of the Annotated Code of Maryland;

(6) Been convicted of conspiracy to commit any act or omission that would constitute grounds for conviction or liability under any law or statute described in subsections (1) - (5) above;

(7) Been found civilly liable under a state or federal antitrust statute for acts or omissions in connection with the submission of bids or proposals for a public or private contract;

(8) Been found in a final adjudicated decision to have violated the Commercial Nondiscrimination Policy under Title 19 of the State Finance and Procurement Article of the Annotated Code of Maryland with regard to a public or private contract; or

(9) Admitted in writing or under oath, during the course of an official investigation or other proceedings, acts or omissions that would constitute grounds for conviction or liability under any law or statute described in §§B and C and subsections D(1)—(8) above, except as follows (indicate reasons why the affirmations cannot be given, and list any conviction, plea, or imposition of probation before judgment with the date, court, official or administrative body, the sentence or disposition, the name(s) of the person(s) involved and their current positions and responsibilities with the business, and the status of any debarment):

D. AFFIRMATION REGARDING DEBARMENT

I FURTHER AFFIRM THAT:  Neither I, nor to the best of my knowledge, information, and belief, the above business, or any of its officers, directors, partners, controlling stockholders, or any of its employees directly involved in the business's contracting activities, including obtaining or performing contracts with public bodies, has ever been suspended or debarred (including being issued a limited denial of participation) by any public entity, except as follows (list each debarment or suspension providing the dates of the suspension or debarment, the name of the public entity and the status of the proceedings, the name(s) of the person(s) involved and their current positions and responsibilities with the business, the grounds of the debarment or suspension, and the details of each person’s involvement in any activity that formed the grounds of the debarment or suspension).

E. AFFIRMATION REGARDING DEBARMENT OF RELATED ENTITIES

I FURTHER AFFIRM THAT:

(1) The business was not established and it does not operate in a manner designed to evade the application of or defeat the purpose of debarment pursuant to Sections 16-101, et seq., of the State Finance and Procurement Article of the Annotated Code of Maryland; and
(2) The business is not a successor, assignee, subsidiary, or affiliate of a suspended or debarred business, except as follows (indicate reasons why the affirmations cannot be given without qualification):

F. SUB-CONTRACT AFFIRMATION

I FURTHER AFFIRM THAT: Neither I, nor to the best of my knowledge, information, and belief, the above business, has knowingly entered into a contract with a public body under which a person debarred or suspended under Title 16 of the State Finance and Procurement Article of the Annotated Code of Maryland will provide, directly or indirectly, supplies, services, architectural services, construction related services, leases of real property, or construction.

G. AFFIRMATION REGARDING COLLUSION

I FURTHER AFFIRM THAT: Neither I, nor to the best of my knowledge, information, and belief, the above business has:

(1) Agreed, conspired, connived, or colluded to produce a deceptive show of competition in the compilation of the accompanying bid or offer that is being submitted;

(2) In any manner, directly or indirectly, entered into any agreement of any kind to fix the bid price or price proposal of the bidder or offeror or of any competitor, or otherwise taken any action in restraint of free competitive bidding in connection with the contract for which the accompanying bid or offer is submitted.

H. CERTIFICATION OF TAX PAYMENT

I FURTHER AFFIRM THAT: Except as validly contested, the business has paid, or has arranged for payment of, all taxes due the State of Maryland and has filed all required returns and reports with the Comptroller of the Treasury, the State Department of Assessments and Taxation, and the Department of Labor, Licensing, and Regulation, as applicable, and will have paid all withholding taxes due the State of Maryland prior to final settlement.

I. CONTINGENT FEES

I FURTHER AFFIRM THAT: The business has not employed or retained any person, partnership, corporation, or other entity, other than a bona fide employee, bona fide agent, bona fide salesperson, or commercial selling agency working for the business, to solicit or secure the Contract, and that the business has not paid or agreed to pay any person, partnership, corporation, or other entity, other than a bona fide employee, bona fide agent, bona fide salesperson, or commercial selling agency, any fee or any other consideration contingent on making of the Contract.

J. CERTIFICATION REGARDING INVESTMENTS IN IRAN

(1) The undersigned bidder or offeror certifies that, in accordance with State Finance & Procurement Article, §17-705:

   (i) it is not identified on the list created by the Board of Public Works as a person engaging in investment activities in Iran as described in §17-702 of State Finance & Procurement; and

   (ii) it is not engaging in investment activities in Iran as described in State Finance & Procurement Article, §17-702.
(2) The undersigned bidder or offeror is unable to make the above certification regarding its investment activities in Iran due to the following activities:


K. ACKNOWLEDGEMENT

I ACKNOWLEDGE THAT: This Affidavit is to be furnished to the Procurement Officer and may be distributed to units of: (1) the State of Maryland; (2) counties or other subdivisions of the State of Maryland; (3) other states; and (4) the federal government. I further acknowledge that this Affidavit is subject to applicable laws of the United States and the State of Maryland, both criminal and civil, and that nothing in this Affidavit or any contract resulting from the submission of this bid or proposal shall be construed to supersede, amend, modify or waive, on behalf of the State of Maryland, or any unit of the State of Maryland having jurisdiction, the exercise of any statutory right or remedy conferred by the Constitution and the laws of Maryland with respect to any misrepresentation made or any violation of the obligations, terms and covenants undertaken by the above business with respect to (1) this Affidavit, (2) the contract, and (3) other Affidavits comprising part of the contract.

I DO SOLEMNLY DECLARE AND AFFIRM UNDER THE PENALTIES OF PERJURY THAT THE CONTENTS OF THIS AFFIDAVIT ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF.

Date: ________________________

By: __________________________

(Print Name of Authorized Representative and Affiant)

(Signature of Authorized Representative and Affiant)

(Title of Authorized Representative and Affiant)
EXHIBIT C
CONTRACT AFFIDAVIT

A. AUTHORIZED REPRESENTATIVE

I HEREBY AFFIRM THAT:

I am the _______________________________(title) and the duly authorized representative of _______________________________(business) and that I possess the legal authority to make this Affidavit on behalf of myself and the business for which I am acting.

B. CERTIFICATION OF CORPORATION REGISTRATION AND TAX PAYMENT OR QUALIFICATION WITH THE STATE DEPARTMENT OF ASSESSMENTS AND TAXATION

I FURTHER AFFIRM THAT: The business named above is a (X applicable items):

(1) ☐ Corporation ☐ domestic (i.e., organized in Maryland) or ☐ foreign;
(2) ☐ Limited Liability Co. ☐ domestic or ☐ foreign;
(3) ☐ Partnership ☐ domestic or ☐ foreign;
(4) ☐ Statutory Trust ☐ domestic or ☐ foreign;
(5) ☐ Sole Proprietorship

and is registered or qualified as required under Maryland Law.

I further affirm that the above business is in good standing both in Maryland and (IF APPLICABLE) in the jurisdiction where it is presently organized, and has filed all of its annual reports, together with filing fees, with the Maryland State Department of Assessments and Taxation. The name and address of its resident agent (IF APPLICABLE) filed with the State Department of Assessments and Taxation is:

Name and Department ID Number: ____________________________________________

Address: ____________________________________________

and that if it does business under a trade name, it has filed a certificate with the State Department of Assessments and Taxation that correctly identifies that true name and address of the principal or owner as:

Name and Department ID Number: ____________________________________________

Address: ____________________________________________

C. FINANCIAL DISCLOSURE AFFIRMATION

I FURTHER AFFIRM THAT: I am aware of, and the above business will comply with, the provisions of Section 13-221 of the State Finance and Procurement Article of the Annotated Code of Maryland, which require that every business that enters into contracts, leases, or other agreements with the State of Maryland or its agencies during a calendar year under which the business is to receive in the aggregate $100,000 or more shall, within 30 days of the time when the aggregate value of the contracts, leases, or other agreements reaches $100,000, file with the Secretary of State of Maryland certain specified information to include disclosure of beneficial ownership of the business.
D. POLITICAL CONTRIBUTION DISCLOSURE AFFIRMATION

I FURTHER AFFIRM THAT: I am aware of, and the above business will comply with, Election Law Article, §§14-101 through 14-108, Annotated Code of Maryland, which requires that every person that enters into contracts, leases, or other agreements with the State of Maryland, including its agencies or a political subdivision of the State valued at $200,000 or more, shall file with the State Board of Elections a statement disclosing contributions in excess of $500 made during the reporting period to a candidate for elective office in any primary or general election.

E. DRUG AND ALCOHOL FREE WORKPLACE

I CERTIFY THAT:

(1) Terms defined in COMAR 21.11.08 shall have the same meanings when used in this certification.

(2) By submission of its bid or offer, the business, if other than an individual, certifies and agrees that, with respect to its employees to be employed under a contract resulting from this solicitation, the business shall:

   (a) Maintain a workplace free of drug and alcohol abuse during the term of the contract;

   (b) Publish a statement notifying its employees that the unlawful manufacture, distribution, dispensing, possession, or use of drugs, and the abuse of drugs or alcohol is prohibited in the business's workplace and specifying the actions that will be taken against employees for violation of these prohibitions;

   (c) Prohibit its employees from working under the influence of drugs or alcohol;

   (d) Not hire or assign to work on the contract anyone whom the business knows, or in the exercise of due diligence should know, currently abuses drugs or alcohol and is not actively engaged in a bona fide drug or alcohol abuse assistance or rehabilitation program;

   (e) Promptly inform the appropriate law enforcement agency of every drug-related crime that occurs in its workplace if the business has observed the violation or otherwise has reliable information that a violation has occurred;

   (f) Establish drug and alcohol abuse awareness programs to inform its employees about:

      (i) The dangers of drug and alcohol abuse in the workplace;

      (ii) The business's policy of maintaining a drug and alcohol free workplace;

      (iii) Any available drug and alcohol counseling, rehabilitation, and employee assistance programs; and

      (iv) The penalties that may be imposed upon employees who abuse drugs and alcohol in the workplace;

   (g) Provide all employees engaged in the performance of the contract with a copy of the statement required by §(2)(b), above;

   (h) Notify its employees in the statement required by §(2)(b) above, that as a condition of continued employment on the contract, the employee shall:

      (i) Abide by the terms of the statement; and

      (ii) Notify the employer of any criminal drug or alcohol abuse conviction for an offense occurring in the workplace not later than 5 days after a conviction;

   (i) Notify the procurement officer within 10 days after receiving notice under §(2)(h)(ii), above, or otherwise receiving actual notice of a conviction;

   (j) Within 30 days after receiving notice under §(2)(h)(ii) above, or otherwise receiving actual notice of a conviction, impose either of the following sanctions or remedial measures on any employee who is convicted of a drug or alcohol abuse offense occurring in the workplace:
(i) Take appropriate personnel action against an employee, up to and including termination; or

(ii) Require an employee to satisfactorily participate in a bona fide drug or alcohol abuse assistance or rehabilitation program; and

(k) Make a good faith effort to maintain a drug and alcohol free workplace through implementation of §(2)(a) through (j), above.

(3) If the business is an individual, the individual shall certify and agree as set forth in §(4), below, that the individual shall not engage in the unlawful manufacture, distribution, dispensing, possession, or use of drugs or the abuse of drugs or alcohol in the performance of the contract.

(4) I acknowledge and agree that:

(a) The award of the contract is conditional upon compliance with COMAR 21.11.08 and this certification;

(b) The violation of the provisions of COMAR 21.11.08 or this certification shall be cause to suspend payments under, or terminate the contract for default under COMAR 21.07.01.11 or 21.07.03.15, as applicable; and

(c) The violation of the provisions of COMAR 21.11.08 or this certification in connection with the contract may, in the exercise of the discretion of the Board of Public Works, result in suspension and debarment of the business under COMAR 21.08.03.

F. CERTAIN AFFIRMATIONS VALID

I FURTHER AFFIRM THAT:

To the best of my knowledge, information, and belief, each of the affirmations, certifications, or acknowledgments contained in that certain Bid/Proposal Affidavit dated __________, 20 __ and executed by me for the purpose of obtaining the contract to which this Exhibit is attached remains true and correct in all respects as if made as of the date of this Contract Affidavit and as if fully set forth herein.

I DO SOLEMNLY DECLARE AND AFFIRM UNDER THE PENALTIES OF PERJURY THAT THE CONTENTS OF THIS AFFIDAVIT ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF.

DATE: ___________________________

BY: _________________________________

(Printed Name and Title of Authorized Representative and Affiant)

(Signature of Authorized Representative and Affiant)
EXHIBIT D
SAMPLE AGREEMENT

This Agreement made the _________ day of __________________________, Two Thousand and _____, by and between _________________________, herein called "Contractor" and Towson University, herein called "University." Witnesseth, that the Contractor and the University, for the consideration here mentioned agree as follows:

Article 1. Scope of Contract - The Contractor shall furnish all materials and perform all of the work described in the Contract Documents, and shall comply with all of the terms and conditions of the Contract Documents, all of which are made a part hereof and are referred to herein as "the Contract."

Article 2. Contract Documents - The Contract between the parties is set forth in the Contract Documents which consist of the following, listed in their order of precedence:
   A. This Contract,
   B. Towson University - Request for Proposal, for the Procurement of ____________________________, Towson University, RFP No. __________ including all attachments, exhibits, and addenda, and subsequent Purchase Order, and
   C. Contractor's Proposal dated ______________, submitted in response to the RFP (hereinafter referred to as the "Proposal").

In the event of a conflict between the terms and conditions of any of the Contract Documents, the controlling terms and conditions shall be in the above listed order of precedence.

Article 3. Services - The Contractor’s performance under this Contract shall be in accordance with the requirements generally set forth in the RFP and specifically described in Section V., Specifications and as set forth in the Contractor's Technical Proposal.

Article 4. Term of Contract – The term of the contract shall be one year from the date that the University provides the Contractor with a Notice to Proceed. The University shall have the option to exercise four annual renewal options, said options to be exercised at the sole discretion of the University. Should the University elect to renew the contract, all prices, terms and conditions will remain in effect.

Article 5. Contract Price - The University shall pay the Contractors as follows:

Total Project Cost $______________

Article 6. Payment of State Obligations - Contractor will be paid for services rendered in accordance with the terms and conditions of the Contract Documents and upon submission of proper invoices submitted to the Towson University, Accounts Payable Office. The Contractor's Federal Identification Number and the University's Purchase Order number must be included on all invoices. Towson University is exempt from the payment of taxes and shall provide the Contractor with a copy of tax-exempt certificate upon request.
Electronic funds will be used by the State to pay Contractor for this Contract and any other State payments due Contractor unless the State Comptroller’s Office grants Contractor an exemption.

Electronic funds will be used by the State to pay Contractor for this Contract and any other State payments due Contractor unless the State Comptroller’s Office grants Contractor an exemption.

Article 7. Limitation of Liability - The University shall not be liable for any indirect, special or consequential damages, such as loss of anticipated profits or other economic loss in connection with or arising out of the services provided in the Contract.

Article 8. Assignment - University may assign this Contract with Contractor's written consent, which shall not be unreasonably withheld.

Article 9. Entire Agreement - This Contract, including all Contract Documents, constitutes the entire agreement between the University and the Contractor. No waiver, modification or amendment of any of the terms or conditions hereof shall be effective unless set forth in writing and duly signed by the Contractor and the University.

IN WITNESS WHEREOF, the parties have executed this Contract by their duly authorized officer, agents or official on the day and year first above written.

CONTRACTOR

Witness

Corporate Officer or Authorized Agent

Date

AFFIX

CORPORATE

SEAL

Printed Name and Title

TOWSON UNIVERSITY

Witness

Authorized Agent

Date

Printed Name and Title
EXHIBIT E

MINORITY BUSINESS ENTERPRISE (MBE) PARTICIPATION
This form includes Instructions and the MBE Utilization and Fair Solicitation Affidavit & MBE Participation Schedule which must be submitted with the bid/proposal. If the bidder/offeror fails to accurately complete and submit this Affidavit and Schedule with the bid or proposal, the Procurement Officer shall deem the bid non-responsive or shall determine that the proposal is not reasonably susceptible of being selected for award.

1. Contractor shall structure its procedures for the performance of the work required in this Contract to attempt to achieve the minority business enterprise (MBE) subcontractor participation goal stated in the Invitation for Bids or Request for Proposals. Contractor agrees to exercise good faith efforts to carry out the requirements set forth in these Instructions, as authorized by the Code of Maryland Regulations (COMAR) 21.11.03.

2. MBE Goals and Subgoals: Please review the solicitation for information regarding the Contract’s MBE overall participation goals and subgoals. After satisfying the requirements for any established subgoals, the Contractor is encouraged to use a diverse group of subcontractors and suppliers from the various MBE classifications to meet the remainder of the overall MBE participation goal.

3. MBE means a minority business enterprise that is certified by the Maryland Department of Transportation (“MDOT”). Only MBEs certified by MDOT may be counted for purposes of achieving the MBE participation goals. In order to be counted for purposes of achieving the MBE participation goals, the MBE firm, including a MBE prime, must be MDOT-certified for the services, materials or supplies that it is committed to perform on the MBE Participation Schedule. A firm whose MBE certification application is pending may not be counted.

4. Please refer to the MDOT MBE Directory at https://mbe.mdot.maryland.gov/directory/ to determine if a firm is certified with the appropriate North American Industry Classification System (“NAICS”) code and the product/services description (specific product that a firm is certified to provide or specific areas of work that a firm is certified to perform). For more general information about NAICS codes, please visit https://www.census.gov/eos/www/naics/. Only those specific products and/or services for which a firm is certified in the MDOT Directory can be used for purposes of achieving the MBE participation goals. CAUTION: If the firm’s NAICS code is in graduated status, such services/products may not be counted for purposes of achieving the MBE participation goals. A NAICS code is in the graduated status if the term “Graduated” follows the code in the MDOT MBE Directory.

5. Guidelines Regarding MBE Prime Self-Performance. Please note that when a certified MBE firm participates as a prime contractor on a Contract, a procurement agency may count the distinct, clearly defined portion of the work of the Contract that the certified MBE firm performs with its own workforce toward fulfilling up to, but no more than, fifty-percent (50%) of the overall MBE participation goal, including up to one hundred percent (100%) of not more than one of the MBE participation subgoals, if any, established for the Contract.
In order to receive credit for self-performance, an MBE prime must be certified in the appropriate NAICS code to do the work and must list its firm in the MBE Participation Schedule, including the certification category under which the MBE prime is self-performing and include information regarding the work it will self-perform.

For the remaining portion of the overall goal and the remaining subgoals, the MBE prime must also identify on the MBE Participation Schedule the other certified MBE subcontractors used to meet those goals or request a waiver.

These guidelines apply to the work performed by the MBE Prime that can be counted for purposes of meeting the MBE participation goals. These requirements do not affect the MBE Prime’s ability to self-perform a greater portion of the work in excess of what is counted for purposes of meeting the MBE participation goals.

Please note that the requirements to meet the MBE participation overall goal and subgoals are distinct and separate. If the contract has subgoals, regardless of MBE Prime’s ability to self-perform up to 50% of the overall goal (including up to 100% of any subgoal), the MBE Prime must either commit to use other MBEs for each of any remaining subgoals or request a waiver. As set forth in Attachment 1-B Waiver Guidance, the MBE Prime’s ability to self-perform certain portions of the work of the Contract will not be deemed a substitute for the good faith efforts to meet any remaining subgoal or the balance of the overall goal.

In certain instances where the percentages allocated to MBE participation subgoals add up to more than 50% of the overall goal, the portion of self-performed work that an MBE Prime may count toward the overall goal may be limited to less than 50%. Please refer to the Governor's Office of Small Minority & Women Business Affairs’ website for the MBE Prime Regulations Q&A for illustrative examples.

6. Subject to items 1 through 5 above, when a certified MBE performs as a participant in a joint venture, a procurement agency may count a portion of the total dollar value of the Contract equal to the distinct, clearly-defined portion of the work of the Contract that the certified MBE performs with its own forces toward fulfilling the Contract goal, and not more than one of the Contract subgoals, if any.

7. The work performed by a certified MBE firm, including an MBE prime, can only be counted towards the MBE participation goal(s) if the MBE firm is performing a commercially useful function on the Contract. Please refer to COMAR 21.11.03.12-1 for more information regarding these requirements.
8. **Materials and Supplies: New Guidelines Regarding MBE Participation.**

- **Regular Dealer** (generally identified as a wholesaler or supplier in the MDOT Directory): Up to 60% of the costs of materials and supplies provided by a certified MBE may be counted towards the MBE participation goal(s) if such MBE is a Regular Dealer of such materials and supplies. Regular Dealer is defined as a firm that owns, operates, or maintains a store, a warehouse, or any other establishment in which the materials, supplies, articles, or equipment are of the general character described by the specifications required under the contract and are bought, kept in stock, or regularly sold or leased to the public in the usual course of business; and does not include a packager, a broker, a manufacturer’s representative, or any other person that arranges or expedites transactions.

*Example for illustrative purposes of applying the 60% rule*

Overall contract value: $2,000,000  
Total value of supplies: $100,000

Calculate Percentage of Supplies to overall contract value:  
$100,000 divided by $2,000,000 = 5%  
Apply 60% Rule - Total percentage of Supplies/Products 5% x 60% = 3%

*3% would be counted towards achieving the MBE Participation Goal and Subgoal, if any, for the MBE supplier in this example.*

- **Manufacturer:** A certified MBE firm’s participation may be counted in full if the MBE is certified in the appropriate NAICS code(s) to provide products and services as a manufacturer.

- **Broker:** With respect to materials or supplies purchased from a certified MBE that is neither a manufacturer nor a regular dealer, a unit may apply the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, fees, or transportation charges for the delivery of materials and supplies required on a procurement toward the MBE contract goals, provided a unit determines the fees to be reasonable and not excessive as compared with fees customarily allowed for similar services. A unit may not apply any portion of the costs of the materials and supplies toward MBE goals.

- **Furnish and Install and other Services:** The participation of a certified MBE supplier, wholesaler, and/or regular dealer certified in the proper NAICS code(s) to furnish and install materials necessary for successful contract completion may be counted in full. Includes the participation of other MBE service providers in the proper NAICS code(s) may be counted in full.

9. **Dually certified firms.** An MBE that is certified in more than one subgroup category may only be counted toward goal fulfillment of ONE of those categories with regard to a particular contract.

*Example: A woman-owned Hispanic American (dually certified) firm may be used to fulfill the women-owned OR Hispanic American subgoal, but not both on the same contract.*

10. **CAUTION:** The percentage of MBE participation, computed using the percentage amounts determined for all of the MBE firms listed in Part 3, MUST meet or exceed the MBE participation goal and subgoals (if applicable) as set forth in Part 2- for this solicitation. If a bidder/offeror is unable to meet the MBE participation goal or any subgoals (if applicable), then the bidder/offeror must request a waiver in Part 2 or the bid will be deemed not responsive, or the proposal not reasonably susceptible of being selected.
for award. You may wish to use the attached Goal/Subgoal Worksheet to assist in calculating the percentages and confirming that your commitment meets or exceeds the applicable MBE participation goal and subgoals (if any).

11. If you have any questions as to whether a firm is certified to perform the specific services or provide specific products, please contact MDOT’s Office of Minority Business Enterprise at 1-800-544-6056 or via email to mbe@mdot.state.md.us sufficiently prior to the submission due date.

Subgoals (if applicable)

| Total African American MBE Participation: | 8% |
| Total Asian American MBE Participation:   | 3% |
| Total Hispanic American MBE Participation:| 3% |
| Total Women-Owned MBE Participation:      |     |

Overall Goal

Total MBE Participation (include all categories): 29%
PART 2 - MBE UTILIZATION AND FAIR SOLICITATION AFFIDAVIT

This MBE Utilization and Fair Solicitation Affidavit and MBE Participation Schedule must be completed and included with the bid/proposal. If the bidder/offeror fails to accurately complete and submit this Affidavit and the Schedule in Part 3 with the bid or proposal as required, the Procurement Officer shall deem the bid non-responsive or shall determine that the proposal is not reasonably susceptible of being selected for award.

In connection with the bid/proposal submitted in response to Solicitation No. -----, I affirm the following:

1. **MBE Participation (PLEASE CHECK ONLY ONE)**

   - [ ] I acknowledge and intend to meet IN FULL both the overall certified Minority Business Enterprise (MBE) participation goal of 29 percent and all of the following subgoals:
     - 8 percent for African American-owned MBE firms
     - 3 percent for Hispanic American-owned MBE firms
     - 3 percent for Asian American-owned MBE firms

   Therefore, I am not seeking a waiver pursuant to COMAR 21.11.03.11. I acknowledge that by checking the above box and agreeing to meet the stated goal and subgoal(s), if any, I **must** complete Part 3 - MBE Participation Schedule and Part 4 Signature Page in order to be considered for award.

   **OR**

   - [ ] I conclude that I am unable to achieve the MBE participation goal and/or subgoals. I hereby request a waiver, in whole or in part, of the overall goal and/or subgoal(s). I acknowledge that by checking this box and requesting a partial waiver of the stated goal and/or one or more of the stated subgoal(s) if any, I **must** complete Part 3, the MBE Participation Schedule and Part 4 Signature Page for the portion of the goal and/or subgoal(s) if any, for which I am not seeking a waiver, in order to be considered for award. I acknowledge that by checking this box and requesting a full waiver of the stated goal and the stated subgoal(s) if any, I **must** complete Part 4 Signature Page in order to be considered for award.
Additional MBE Documentation

I understand that if I am notified that I am the apparent awardee or as requested by the Procurement Officer, I must submit the following documentation within 10 working days of receiving notice of the potential award or from the date of conditional award (per COMAR 21.11.03.10), whichever is earlier:

(a) Good Faith Efforts Documentation to Support Waiver Request (Attachment __-1C)
(b) Outreach Efforts Compliance Statement (Attachment __-2);
(c) MBE Subcontractor/MBE Prime Project Participation Statement (Attachments __-3A and 3B);
(d) Any other documentation, including additional waiver documentation if applicable, required by the Procurement Officer to ascertain bidder or offeror responsibility in connection with the certified MBE participation goal and subgoals, if any.

I understand that if I fail to return each completed document within the required time, the Procurement Officer may determine that I am not responsible and therefore not eligible for contract award. If the contract has already been awarded, the award is voidable.

Information Provided to MBE firms

In the solicitation of subcontract quotations or offers, MBE firms were provided not less than the same information and amount of time to respond as were non-MBE firms.
PART 3 - MBE PARTICIPATION SCHEDULE

Set forth below are the (i) certified MBEs I intend to use, (ii) the percentage of the total Contract value allocated to each MBE for this project and, (iii) the items of work each MBE will provide under the Contract. I have confirmed with the MDOT database that the MBE firms identified below (including any self-performing MBE prime firms) are performing work activities for which they are MDOT-certified.

<table>
<thead>
<tr>
<th>Prime Contractor</th>
<th>Project Description</th>
<th>Project/Contract Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LIST INFORMATION FOR EACH CERTIFIED MBE FIRM YOU AGREE TO USE TO ACHIEVE THE MBE PARTICIPATION GOAL AND SUBGOALS, IF ANY. MBE PRIMES: PLEASE COMPLETE BOTH SECTIONS A AND B BELOW.

SECTION A: For MBE Prime Contractors ONLY (including MBE Primes in a Joint Venture)

<table>
<thead>
<tr>
<th>MBE Prime Firm</th>
<th>Percentage of total Contract Value to be performed with own forces and counted towards the MBE overall participation goal (up to 50% of the overall goal): ______% Please refer to Item #8 in Part 1- Instructions of this document for new MBE participation guidelines regarding materials and supplies.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:___________</td>
<td>---------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>MBE Certification Number: _________________</td>
<td>Percentage of total Contract Value to be performed with own forces and counted towards the subgoal, if any, for my MBE classification (up to 100% of not more than one subgoal): ______%</td>
</tr>
<tr>
<td>(If dually certified, check only one box.)</td>
<td>Supplier, wholesaler and/or regular dealer (count 60%)</td>
</tr>
<tr>
<td></td>
<td>Manufacturer (count 100%)</td>
</tr>
<tr>
<td></td>
<td>Broker (count reasonable fee/commission only)</td>
</tr>
<tr>
<td></td>
<td>Furnish and Install and other Services (count 100%)</td>
</tr>
</tbody>
</table>

Complete the applicable prompt (select only one) from prompts A-C below that applies to the type of work your firm is self-performing to calculate amount to be counted towards achieving the MBE Participation Goal and Subgoal, if any.

A. Percentage amount of subcontract where the MBE Prime firm is being used for manufacturer, furnish and install, and/or services (excluding products / services from suppliers, wholesalers, regular dealers and brokers) ______% 

B. Percentage amount for items of work where the MBE Prime firm is being used as supplier, wholesaler, and/or regular dealer (60% Rule). Total percentage of Supplies/Products ______% x 60% = ______%

C. Percentage amount of fee where the MBE Prime firm is being used as broker (count reasonable fee/commission only) ______% 

Description of the Work to be performed with MBE prime’s own forces: ________________________________

Percentage of total Contract Value to be performed with own forces and counted towards the subgoal, if any, for my MBE classification (up to 100% of not more than one subgoal): ______%
**SECTION B: For all Contractors (including MBE Primes and MBE Primes in a Joint Venture)**

<table>
<thead>
<tr>
<th>MBE Firm</th>
<th>Please refer to Item #8 in Part 1- Instructions of this document for new MBE participation guidelines regarding materials and supplies.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name: ________________________________</td>
<td>□ Supplier, wholesaler and/or regular dealer (count 60%)</td>
</tr>
<tr>
<td>MBE Certification Number: ____________________</td>
<td>□ Manufacturer (count 100%)</td>
</tr>
<tr>
<td>(If dually certified, check only one box.)</td>
<td>□ Broker (count reasonable fee/commission only)</td>
</tr>
<tr>
<td>□ African American-Owned</td>
<td>□ Furnish and Install and other Services (count 100%)</td>
</tr>
<tr>
<td>□ Hispanic American-Owned</td>
<td></td>
</tr>
<tr>
<td>□ Asian American-Owned</td>
<td></td>
</tr>
<tr>
<td>□ Women-Owned</td>
<td></td>
</tr>
<tr>
<td>□ Other MBE Classification</td>
<td></td>
</tr>
<tr>
<td>NAICS code: ________________________________</td>
<td></td>
</tr>
</tbody>
</table>

Please refer to Item #8 in Part 1- Instructions of this document for new MBE participation guidelines regarding materials and supplies.

Complete the applicable prompt (select only one) from prompts A-C below that applies to the type of work that the MBE firm named to the left will be performing to calculate the amount to be counted towards achieving the MBE Participation Goal and Subgoal, if any.

A. Percentage amount of subcontract where the MBE Firm is being used for manufacturer, furnish and install, and/or services (excluding products/services from suppliers, wholesalers, regular dealers and brokers) _____%

B. Percentage amount for items of work where the MBE Firm is being used as supplier, wholesaler, and/or regular dealer (60% Rule)).

Total percentage of Supplies/Products _____% \times 60\% = _____%

C. Percentage amount of fee where the MBE Firm is being used as broker (count reasonable fee/commission only) _____%

Description of the Work to be Performed:

<table>
<thead>
<tr>
<th>MBE Firm</th>
<th>Please refer to Item #8 in Part 1- Instructions of this document for new MBE participation guidelines regarding materials and supplies.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name: ________________________________</td>
<td>□ Supplier, wholesaler and/or regular dealer (count 60%)</td>
</tr>
<tr>
<td>MBE Certification Number: ____________________</td>
<td>□ Manufacturer (count 100%)</td>
</tr>
<tr>
<td>(If dually certified, check only one box.)</td>
<td>□ Broker (count reasonable fee/commission only)</td>
</tr>
<tr>
<td>□ African American-Owned</td>
<td>□ Furnish and Install and other Services (count 100%)</td>
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<td>□ Hispanic American-Owned</td>
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<td>□ Asian American-Owned</td>
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<td>□ Women-Owned</td>
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<tr>
<td>□ Other MBE Classification</td>
<td></td>
</tr>
<tr>
<td>NAICS code: ________________________________</td>
<td></td>
</tr>
</tbody>
</table>

Please refer to Item #8 in Part 1- Instructions of this document for new MBE participation guidelines regarding materials and supplies.

Complete the applicable prompt (select only one) from prompts A-C below that applies to the type of work that the MBE Firm named to the left will be performing to calculate the amount to be counted towards achieving the MBE Participation Goal and Subgoal, if any.

A. Percentage amount of subcontract where the MBE Firm is being used for manufacturer, furnish and install, and/or services (excluding products/services from suppliers, wholesalers, regular dealers and brokers) _____%

B. Percentage amount for items of work where the MBE Firm is being used as supplier, wholesaler, and/or regular dealer (60% Rule)).

Total percentage of Supplies/Products _____% \times 60\% = _____%

C. Percentage amount of fee where the MBE Firm is being used as broker (count reasonable fee/commission only) _____%

Description of the Work to be Performed:
MBE Firm
Name:______________________________________

MBE Certification Number: ______________________

(If dually certified, check only one box.)
☐ African American-Owned
☐ Hispanic American- Owned
☐ Asian American-Owned
☐ Women-Owned
☐ Other MBE Classification

NAICS code: _______________________________

Please refer to Item #8 in Part 1- Instructions of this document for new MBE participation guidelines regarding materials and supplies.

☐ Supplier, wholesaler and/or regular dealer (count 60%)
☐ Manufacturer (count 100%)
☐ Broker (count reasonable fee/commission only)
☐ Furnish and Install and other Services (count 100%)

Complete the applicable prompt (select only one) from prompts A-C below that applies to the type of work that for the MBE firm named to the left will be performing to calculate the amount to be counted towards achieving the MBE Participation Goal and Subgoal, if any.

A. Percentage amount of subcontract where the MBE firm is being used for manufacturer, furnish and install, and/or services (excluding products/services from suppliers, wholesalers, regular dealers and brokers) ______% 

B. Percentage amount for items of work where the MBE firm is being used as supplier, wholesaler, and/or regular dealer (60% Rule). Total percentage of Supplies/Products _____% X 60% = _____% 

C. Percentage amount of fee where the MBE firm is being used as broker (count reasonable fee/commission only) ______ % 

Description of the Work to be Performed:
_________________________________________________________
_____________________________________
_____________________________________

CONTINUE ON SEPARATE PAGE IF NEEDED
I solemnly affirm under the penalties of perjury that: (i) I have reviewed the instructions for the MBE Utilization & Fair Solicitation Affidavit and MBE Schedule, and (ii) the information contained in the MBE Utilization & Fair Solicitation Affidavit and MBE Schedule is true to the best of my knowledge, information and belief.

Bidder/Offeror Name (PLEASE PRINT OR TYPE)  Signature of Authorized Representative

Address  Printed Name and Title

City, State and Zip Code  Date

SUBMIT THIS AFFIDAVIT WITH BID/PROPOSAL
GUIDANCE FOR DOCUMENTING GOOD FAITH EFFORTS TO MEET MBE PARTICIPATION GOALS

In order to show that it has made good faith efforts to meet the Minority Business Enterprise (MBE) participation goal (including any MBE subgoals) on a contract, the bidder/offeror must either (1) meet the MBE Goal(s) and document its commitments for participation of MBE Firms, or (2) when it does not meet the MBE Goal(s), document its Good Faith Efforts to meet the goal(s).

I. Definitions

MBE Goal(s) – “MBE Goal(s)” refers to the MBE participation goal and MBE participation subgoal(s).

Good Faith Efforts – The “Good Faith Efforts” requirement means that when requesting a waiver, the bidder/offeror must demonstrate that it took all necessary and reasonable steps to achieve the MBE Goal(s), which, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to obtain sufficient MBE participation, even if those steps were not fully successful. Whether a bidder/offeror that requests a waiver made adequate good faith efforts will be determined by considering the quality, quantity, and intensity of the different kinds of efforts that the bidder/offeror has made. The efforts employed by the bidder/offeror should be those that one could reasonably expect a bidder/offeror to take if the bidder/offeror were actively and aggressively trying to obtain MBE participation sufficient to meet the MBE contract goal and subgoals. Mere pro forma efforts are not good faith efforts to meet the MBE contract requirements. The determination concerning the sufficiency of the bidder's/offeror's good faith efforts is a judgment call; meeting quantitative formulas is not required.

Identified Firms – “Identified Firms” means a list of the MBEs identified by the procuring agency during the goal setting process and listed in the procurement as available to perform the Identified Items of Work. It also may include additional MBEs identified by the bidder/offeror as available to perform the Identified Items of Work, such as MBEs certified or granted an expansion of services after the procurement was issued. If the procurement does not include a list of Identified Firms, this term refers to all of the MBE Firms (if State-funded) the bidder/offeror identified as available to perform the Identified Items of Work and should include all appropriately certified firms that are reasonably identifiable.

Identified Items of Work – “Identified Items of Work” means the bid items identified by the procuring agency during the goal setting process and listed in the procurement as possible items of work for performance by MBE Firms. It also may include additional portions of items of work the bidder/offeror identified for performance by MBE Firms to increase the likelihood that the MBE Goal(s) will be achieved. If the procurement does not include a list of Identified Items of Work, this term refers to all of the items of work the bidder/offeror identified as possible items of work for performance by MBE Firms and should include all reasonably identifiable work opportunities.

MBE Firms – “MBE Firms” refers to a firm certified by the Maryland Department of Transportation (“MDOT”) under COMAR 21.11.03. Only MDOT-certified MBE Firms can participate in the State’s MBE Program.

II. Types of Actions Agency Will Consider

The bidder/offeror is responsible for making relevant portions of the work available to MBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available MBE subcontractors and suppliers, so as to facilitate MBE participation. The following is a list of types of actions the procuring agency will consider as part of the bidder's/offeror's Good Faith Efforts when the bidder/offeror fails to meet the MBE Goal(s). This list is not intended to be a mandatory checklist, nor is it intended to be exclusive or exhaustive. Other factors or types of efforts may be relevant in appropriate cases.
A. Identify Bid Items as Work for MBE Firms

1. Identified Items of Work in Procurements

   (a) Certain procurements will include a list of bid items identified during the goal setting process as possible work for performance by MBE Firms. If the procurement provides a list of Identified Items of Work, the bidder/offeror shall make all reasonable efforts to solicit quotes from MBE Firms to perform that work.

   (b) Bidders/Offerors may, and are encouraged to, select additional items of work to be performed by MBE Firms to increase the likelihood that the MBE Goal(s) will be achieved.

2. Identified Items of Work by Bidders/Offerors

   (a) When the procurement does not include a list of Identified Items of Work or for additional Identified Items of Work, bidders/offerors should reasonably identify sufficient items of work to be performed by MBE Firms.

   (b) Where appropriate, bidders/offerors should break out contract work items into economically feasible units to facilitate MBE participation, rather than perform these work items with their own forces. The ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder/offeror of the responsibility to make Good Faith Efforts.

B. Identify MBE Firms to Solicit

1. MBE Firms Identified in Procurements

   (a) Certain procurements will include a list of the MBE Firms identified during the goal setting process as available to perform the items of work. If the procurement provides a list of Identified MBE Firms, the bidder/offeror shall make all reasonable efforts to solicit those MBE firms.

   (b) Bidders/offerors may, and are encouraged to, search the MBE Directory to identify additional MBEs who may be available to perform the items of work, such as MBEs certified or granted an expansion of services after the solicitation was issued.

2. MBE Firms Identified by Bidders/Offerors

   (a) When the procurement does not include a list of Identified MBE Firms, bidders/offerors should reasonably identify the MBE Firms that are available to perform the Identified Items of Work.

   (b) Any MBE Firms identified as available by the bidder/offeror should be certified to perform the Identified Items of Work.

C. Solicit MBEs

1. Solicit all Identified Firms for all Identified Items of Work by providing written notice. The bidder/offeror should:

   (a) provide the written solicitation at least 10 days prior to bid opening to allow sufficient time for the MBE Firms to respond;

   (b) send the written solicitation by first-class mail, facsimile, or email using contact information in the MBE Directory, unless the bidder/offeror has a valid basis for using different contact information; and

   (c) provide adequate information about the plans, specifications, anticipated time schedule for portions of the work to be performed by the MBE, and other requirements of the contract to assist MBE Firms in responding. (This information may be provided by including hard copies in the written solicitation or by electronic means as described in C.3 below.)

2. “All” Identified Firms includes the MBEs listed in the procurement and any MBE Firms you identify as potentially available to perform the Identified Items of Work, but it does not include MBE Firms who are no longer certified to perform the work as of the date the bidder/offeror provides written solicitations.
3. “Electronic Means” includes, for example, information provided via a website or file transfer protocol (FTP) site containing the plans, specifications, and other requirements of the contract. If an interested MBE cannot access the information provided by electronic means, the bidder/offeror must make the information available in a manner that is accessible to the interested MBE.

4. Follow up on initial written solicitations by contacting MBEs to determine if they are interested. The follow up contact may be made:

   (a) by telephone using the contact information in the MBE Directory, unless the bidder/offeror has a valid basis for using different contact information; or

   (b) in writing via a method that differs from the method used for the initial written solicitation.

5. In addition to the written solicitation set forth in C.1 and the follow up required in C.4, use all other reasonable and available means to solicit the interest of MBE Firms certified to perform the work of the contract. Examples of other means include:

   (a) attending any pre-bid meetings at which MBE Firms could be informed of contracting and subcontracting opportunities; and

   (b) if recommended by the procurement, advertising with or effectively using the services of at least two minority focused entities or media, including trade associations, minority/women community organizations, minority/women contractors’ groups, and local, state, and federal minority/women business assistance offices listed on the MDOT Office of Minority Business Enterprise website.

D. Negotiate With Interested MBE Firms

Bidders/Offerors must negotiate in good faith with interested MBE Firms.

1. Evidence of negotiation includes, without limitation, the following:

   (a) the names, addresses, and telephone numbers of MBE Firms that were considered;

   (b) a description of the information provided regarding the plans and specifications for the work selected for subcontracting and the means used to provide that information; and

   (c) evidence as to why additional agreements could not be reached for MBE Firms to perform the work.

2. A bidder/offeror using good business judgment would consider a number of factors in negotiating with subcontractors, including MBE subcontractors, and would take a firm’s price and capabilities as well as contract goals into consideration.

3. The fact that there may be some additional costs involved in finding and using MBE Firms is not in itself sufficient reason for a bidder's/offeror's failure to meet the contract MBE goal(s), as long as such costs are reasonable. Factors to take into consideration when determining whether a MBE Firm’s quote is excessive or unreasonable include, without limitation, the following:

   (a) the dollar difference between the MBE subcontractor’s quote and the average of the other subcontractors’ quotes received by the bidder/offeror;

   (b) the percentage difference between the MBE subcontractor’s quote and the average of the other subcontractors’ quotes received by the bidder/offeror;

   (c) the percentage that the MBE subcontractor’s quote represents of the overall contract amount;

   (d) the number of MBE firms that the bidder/offeror solicited for that portion of the work;

   (e) whether the work described in the MBE and Non-MBE subcontractor quotes (or portions thereof) submitted for review is the same or comparable; and
(f) the number of quotes received by the bidder/offeror for that portion of the work.

4. The above factors are not intended to be mandatory, exclusive, or exhaustive, and other evidence of an excessive or unreasonable price may be relevant.

5. The bidder/offeror may not use its price for self-performing work as a basis for rejecting a MBE Firm’s quote as excessive or unreasonable.

6. The “average of the other subcontractors’ quotes received” by the bidder/offeror refers to the average of the quotes received from all subcontractors. Bidder/offeror should attempt to receive quotes from at least three subcontractors, including one quote from a MBE and one quote from a Non-MBE.

7. A bidder/offeror shall not reject a MBE Firm as unqualified without sound reasons based on a thorough investigation of the firm’s capabilities. For each certified MBE that is rejected as unqualified or that placed a subcontract quotation or offer that the bidder/offeror concludes is not acceptable, the bidder/offeror must provide a written detailed statement listing the reasons for this conclusion. The bidder/offeror also must document the steps taken to verify the capabilities of the MBE and Non-MBE Firms quoting similar work.

(a) The factors to take into consideration when assessing the capabilities of a MBE Firm, include, but are not limited to the following: financial capability, physical capacity to perform, available personnel and equipment, existing workload, experience performing the type of work, conduct and performance in previous contracts, and ability to meet reasonable contract requirements.

(b) The MBE Firm’s standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the efforts to meet the project goal.

E. Assisting Interested MBE Firms

When appropriate under the circumstances, the decision-maker will consider whether the bidder/offeror:

1. made reasonable efforts to assist interested MBE Firms in obtaining the bonding, lines of credit, or insurance required by the procuring agency or the bidder/offeror; and

2. made reasonable efforts to assist interested MBE Firms in obtaining necessary equipment, supplies, materials, or related assistance or services.

III. Other Considerations

In making a determination of Good Faith Efforts the decision-maker may consider engineering estimates, catalogue prices, general market availability and availability of certified MBE Firms in the area in which the work is to be performed, other bids or offers and subcontract bids or offers substantiating significant variances between certified MBE and Non-MBE costs of participation, and their impact on the overall cost of the contract to the University and any other relevant factors.

The decision-maker may take into account whether a bidder/offeror decided to self-perform subcontract work with its own forces, especially where the self-performed work is Identified Items of Work in the procurement. The decision-maker also may take into account the performance of other bidders/offerors in meeting the contract. For example, when the apparent successful bidder/offeror fails to meet the contract goal, but others meet it, this reasonably raises the question of whether, with additional reasonable efforts, the apparent successful bidder/offeror could have met the goal. If the apparent successful bidder/offeror fails to meet the goal, but meets or exceeds the average MBE participation obtained by other bidders/offerors, this, when viewed in conjunction with other factors, could be evidence of the apparent successful bidder/offeror having made Good Faith Efforts.

IV. Documenting Good Faith Efforts

At a minimum, a bidder/offeror seeking a waiver of the MBE Goal(s) or a portion thereof must provide written documentation of its Good Faith Efforts, in accordance with COMAR 21.11.03.11, within 10 business days after receiving notice that it is the apparent awardee. The written documentation shall include the following:
A. Items of Work (Complete Good Faith Efforts Documentation Attachment 1-C, Part 1)

A detailed statement of the efforts made to select portions of the work proposed to be performed by certified MBE Firms in order to increase the likelihood of achieving the stated MBE Goal(s).

B. Outreach/Solicitation/Negotiation

1. The record of the bidder’s/offor’s compliance with the outreach efforts prescribed by COMAR 21.11.03.09C(2)(a). (Complete Outreach Efforts Compliance Statement – Attachment 2).

2. A detailed statement of the efforts made to contact and negotiate with MBE Firms including:

   (a) the names, addresses, and telephone numbers of the MBE Firms who were contacted, with the dates and manner of contacts (letter, fax, email, telephone, etc.) (Complete Good Faith Efforts Attachment 1-C- Part 2, and submit letters, fax cover sheets, emails, etc. documenting solicitations); and

   (b) a description of the information provided to MBE Firms regarding the plans, specifications, and anticipated time schedule for portions of the work to be performed and the means used to provide that information.

C. Rejected MBE Firms (Complete Good Faith Efforts Attachment 1-C, Part 3)

1. For each MBE Firm that the bidder/offeror concludes is not acceptable or qualified, a detailed statement of the reasons for the bidder’s/offor’s conclusion, including the steps taken to verify the capabilities of the MBE and Non-MBE Firms quoting similar work.

2. For each certified MBE Firm that the bidder/offeror concludes has provided an excessive or unreasonable price, a detailed statement of the reasons for the bidder’s/offor’s conclusion, including the quotes received from all MBE and Non-MBE firms bidding on the same or comparable work. (Include copies of all quotes received.)

3. A list of MBE Firms contacted but found to be unavailable. This list should be accompanied by a MBE Unavailability Certificate (see Exhibit A to this Part 1) signed by the MBE contractor or a statement from the bidder/offeror that the MBE contractor refused to sign the MBE Unavailability Certificate.

D. Other Documentation

1. Submit any other documentation requested by the Procurement Officer to ascertain the bidder’s/offor’s Good Faith Efforts.

2. Submit any other documentation the bidder/offeror believes will help the Procurement Officer ascertain its Good Faith Efforts.
Exhibit A

MBE Subcontractor Unavailability Certificate

1. It is hereby certified that the firm of __________________________

   (name of minority firm)

   Located at __________________________

   (Number) __________________________

   (Street)

   __________________________

   (City) __________________________

   (State) __________________________

   (Zip)

   Was offered an opportunity to bid on Solicitation No. __________________________

   In County by __________________________

   (Name of Prime Contractor’s Firm)

**************************************************************************************

2. __________________________ (Minority Firm) is either unavailable for the work/service or unable to

   Bid for this project for the following reason(s)?

   __________________________

   __________________________

   __________________________

   __________________________

   __________________________

   __________________________

   __________________________

   __________________________

   __________________________

   __________________________

   __________________________

   Signature of Minority Firm’s MBE Representative       Title       Date

   MDOT Certification #       Telephone #

**************************************************************************************

3. To be completed by the prime contractor if Section 2 of this form is not completed by the minority firm.

   To the best of my knowledge and belief, said Certified Minority Business Enterprise is either unavailable

   for the work/service for this project, is unable to prepare a bid, or did not respond to a request for a price

   proposal and has not completed the above portion of this submittal.

   Signature of Prime Contractor       Title       Date
**MBE ATTACHMENT 1C**

**GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST**

* PAGE ____ OF ____*

<table>
<thead>
<tr>
<th>Prime Contractor</th>
<th>Project Description</th>
<th>Solicitation Number</th>
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</table>

**PARTS 1, 2, AND 3 MUST BE INCLUDED WITH THIS CERTIFICATE ALONG WITH ALL DOCUMENTS SUPPORTING YOUR WAIVER REQUEST.**

I affirm that I have reviewed Attachment 1B, Waiver Guidance. I further affirm under penalties of perjury that the contents of Parts 1, 2, and 3 of this Attachment 1C Good Faith Efforts Documentation Form are true to the best of my knowledge, information, and belief.

______________________________  ________________________________
Company Name      Signature of Representative

______________________________  ________________________________
Address       Printed Name and Title

______________________________  ________________________________
City, State and Zip Code     Date
GOOD FAITH EFFORTS DOCUMENTATION
TO SUPPORT WAIVER REQUEST

PART 1 – IDENTIFIED ITEMS OF WORK BIDDER/OFFEROR MADE AVAILABLE TO MBE FIRMS

Identified those items of work that the bidder/offeror made available to MBE Firms. This includes, where appropriate, those items the bidder/offeror identified and determined to subdivide into economically feasible units to facilitate the MBE participation. For each item listed, show the anticipated percentage of the total contract amount. It is the bidder’s/offeror’s responsibility to demonstrate that sufficient work to meet the goal was made available to MBE Firms, and the total percentage of the items of work identified for MBE participation equals or exceeds the percentage MBE goal set for the procurement. Note: If the procurement includes a list of bid items identified during the goal setting process as possible items of work for performance by MBE Firms, the bidder/offeror should make all of those items of work available to MBE Firms or explain why that item was not made available. If the bidder/offeror selects additional items of work to make available to MBE Firms, those additional items should also be included below.

<table>
<thead>
<tr>
<th>Identified Items of Work</th>
<th>Was this work listed in the procurement?</th>
<th>Does bidder/offeror normally self-perform this work?</th>
<th>Was this work made available to MBE Firms? If no, explain why?</th>
</tr>
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<tbody>
<tr>
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<td>□ Yes □ No</td>
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</table>

☐ Please check if Additional Sheets are attached.
GOOD FAITH EFFORTS DOCUMENTATION  
TO SUPPORT WAIVER REQUEST  
PART 2 – IDENTIFIED MBE FIRMS AND RECORD OF SOLICITATIONS

Identify the MBE Firms solicited to provide quotes for the Identified Items of Work made available for MBE participation. Include the name of the MBE Firm solicited, items of work for which bids/quotes were solicited, date and manner of initial and follow-up solicitations, whether the MBE provided a quote, and whether the MBE is being used to meet the MBE participation goal. MBE Firms used to meet the participation goal must be included on the MBE Participation Schedule. Note: If the procurement includes a list of the MBE Firms identified during the goal setting process as potentially available to perform the items of work, the bidder/offeror should solicit all of those MBE Firms or explain why a specific MBE was not solicited. If the bidder/offeror identifies additional MBE Firms who may be available to perform Identified Items of Work, those additional MBE Firms should also be included below. Copies of all written solicitations and documentation of follow-up calls to MBE Firms must be attached to this form. This list should be accompanied by a Minority Contractor Unavailability Certificate signed by the MBE contractor or a statement from the bidder/offeror that the MBE contractor refused to sign the Minority Contractor Unavailability Certificate (see Exhibit A to MBE Attachment 1-B). If the bidder/offeror used a Non-MBE or is self-performing the identified items of work, Part 4 must be completed.

<table>
<thead>
<tr>
<th>Name of Identified MBE Firm &amp; MBE Classification</th>
<th>Describe Item of Work Solicited</th>
<th>Initial Solicitation Date &amp; Method</th>
<th>Follow-up Solicitation Date &amp; Method</th>
<th>Details for Follow-up Calls</th>
<th>Quote Rec’d</th>
<th>Quote Used</th>
<th>Reason Quote Rejected</th>
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<td>Date: _______</td>
<td>Date: _______</td>
<td>Time of Call: ______</td>
<td>□ Yes □ No</td>
<td>□ Yes □ No</td>
<td>□ Used Other MBE</td>
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<tr>
<td>MBE Classification (Check only if requesting waiver of MBE subgoal.)</td>
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<td>□ Mail □ Facsimile □ Email</td>
<td>□ Mail □ Facsimile □ Email</td>
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Please check if Additional Sheets are attached.
GOOD FAITH EFFORTS DOCUMENTATION  
TO SUPPORT WAIVER REQUEST

PART 3 – ADDITIONAL INFORMATION REGARDING REJECTED MBE QUOTES

PAGE ___ OF ___

<table>
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<th>Prime Contractor</th>
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</tbody>
</table>

This form must be completed if Part 1 indicates that a MBE quote was rejected because the bidder/offoror is using a Non-MBE or is self-performing the Identified Items of Work. Provide the Identified Items Work, indicate whether the work will be self-performed or performed by a Non-MBE, and if applicable, state the name of the Non-MBE. Also include the names of all MBE and Non-MBE Firms that provided a quote and the amount of each quote.

<table>
<thead>
<tr>
<th>Describe Identified Items of Work Not Being Performed by MBE (include spec/section number from bid)</th>
<th>Self-performing or Using Non-MBE (Provide name)</th>
<th>Amount of Non-MBE Quote</th>
<th>Name of Other Firms who Provided Quotes &amp; Whether MBE or Non-MBE</th>
<th>Amount Quoted</th>
<th>Indicate Reason Why MBE Quote Rejected &amp; Briefly Explain</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Self-performing □ Using Non-MBE</td>
<td>$__________</td>
<td></td>
<td>□ MBE □ Non-MBE</td>
<td>$__________</td>
<td>□ Price □ Capabilities □ Other</td>
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<td>_________</td>
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<td>□ MBE □ Non-MBE</td>
<td>$__________</td>
<td>□ Price □ Capabilities □ Other</td>
</tr>
<tr>
<td>□ Self-performing □ Using Non-MBE</td>
<td>$__________</td>
<td></td>
<td>□ MBE □ Non-MBE</td>
<td>$__________</td>
<td>□ Price □ Capabilities □ Other</td>
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<td>□ MBE □ Non-MBE</td>
<td>$__________</td>
<td>□ Price □ Capabilities □ Other</td>
</tr>
<tr>
<td>□ Self-performing □ Using Non-MBE</td>
<td>$__________</td>
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<td>□ MBE □ Non-MBE</td>
<td>$__________</td>
<td>□ Price □ Capabilities □ Other</td>
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<td>□ MBE □ Non-MBE</td>
<td>$__________</td>
<td>□ Price □ Capabilities □ Other</td>
</tr>
<tr>
<td>□ Self-performing □ Using Non-MBE</td>
<td>$__________</td>
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<td>□ MBE □ Non-MBE</td>
<td>$__________</td>
<td>□ Price □ Capabilities □ Other</td>
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<td>_________</td>
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<td>□ MBE □ Non-MBE</td>
<td>$__________</td>
<td>□ Price □ Capabilities □ Other</td>
</tr>
</tbody>
</table>

☐ Please check if Additional Sheets are attached.
MBE Attachment 2
OUTREACH EFFORTS COMPLIANCE STATEMENT

Complete and submit this form within 10 working days of notification of apparent award or actual award, whichever is earlier.

In conjunction with the bid/proposal submitted in response to Solicitation No.__________, I state the following:

1. Bidder/Offeror identified subcontracting opportunities in these specific work categories:
   ___________________________________________________________________________
   ___________________________________________________________________________
   ___________________________________________________________________________

2. Attached to this form are copies of written solicitations (with bidding/proposal instructions) used to solicit certified MBE firms for these subcontract opportunities.

3. Bidder/Offeror made the following attempts to personally contact the solicited MDOT-certified MBE firms:  ______________________________________________________________________
   ___________________________________________________________________________
   ___________________________________________________________________________

4. Please Check One:
   □ This project does not involve bonding requirements.
   □ Bidder/Offeror assisted MDOT-certified MBE firms to fulfill or seek waiver of bonding requirements.
   (DESCRIBE EFFORTS):  ______________________________________________________
   ___________________________________________________________________________

5. Please Check One:
   □ Bidder/Offeror did attend the pre-bid/pre-proposal conference.
   □ No pre-bid/pre-proposal meeting/conference was held.
   □ Bidder/Offeror did not attend the pre-bid/pre-proposal conference.

_________________________________  _____________________________
Company Name       Signature of Representative

_________________________________  _____________________________
Address        Printed Name and Title

_________________________________  _____________________________
City, State and Zip Code      Date
MBE Attachment 3A

MBE SUBCONTRACTOR PROJECT PARTICIPATION CERTIFICATION

PLEASE COMPLETE AND SUBMIT ONE FORM FOR EACH CERTIFIED MBE FIRM LISTED ON THE MBE PARTICIPATION SCHEDULE (ATTACHMENT 1A) WITHIN 10 WORKING DAYS OF NOTIFICATION OF APPARENT AWARD. IF THE BIDDER/OFFEROR FAILS TO RETURN THIS AFFIDAVIT WITHIN THE REQUIRED TIME, THE PROCUREMENT OFFICER MAY DETERMINE THAT THE BIDDER/OFFEROR IS NOT RESPONSIBLE AND THEREFORE NOT ELIGIBLE FOR CONTRACT AWARD.

Provided that __________________________ (Prime Contractor’s Name) is awarded the contract in conjunction with Solicitation No. __________, such Prime Contractor intends to enter into a subcontract with_________________________ (Subcontractor’s Name) committing to participation by the MBE firm ___________________________________________ (MBE Name) with MDOT Certification Number __________________ which will receive at least $___________ which equals to_____% of the Total Contract Amount for performing the following products/services for the Contract:

<table>
<thead>
<tr>
<th>NAICS CODE</th>
<th>WORK ITEM, SPECIFICATION NUMBER, LINE ITEMS OR WORK CATEGORIES (IF APPLICABLE)</th>
<th>DESCRIPTION OF SPECIFIC PRODUCTS AND/OR SERVICES</th>
</tr>
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</tr>
</tbody>
</table>

Each of the Contractor and Subcontractor acknowledges that, for purposes of determining the accuracy of the information provided herein, the Procurement Officer may request additional information, including, without limitation, copies of the subcontract agreements and quotes. Each of the Contractor and Subcontractor solemnly affirms under the penalties of perjury that: (i) the information provided in this MBE Subcontractor Project Participation Affidavit is true to the best of its knowledge, information and belief, and (ii) has fully complied with the State Minority Business Enterprise law, State Finance and Procurement Article §14-308(a)(2), Annotated Code of Maryland which provides that, except as otherwise provided by law, a contractor may not identify a certified minority business enterprise in a Bid/Proposal and:

(1) fail to request, receive, or otherwise obtain authorization from the certified minority business enterprise to identify the certified Minority Business Enterprise in its Bid/Proposal;

(2) fail to notify the certified Minority Business Enterprise before execution of the Contract of its inclusion of the Bid/Proposal;

(3) fail to use the certified Minority Business Enterprise in the performance of the Contract; or

(4) pay the certified Minority Business Enterprise solely for the use of its name in the Bid/Proposal.

PRIME CONTRACTOR

Signature of Representative: __________________________

Printed Name and Title: ______________________________________________________

Firm’s Name: ________________________________________________________________

Federal Identification Number: ________________________________

Address: ___________________________________________________________________

____________________________________________________________________________

Telephone: __________________________ Date: __________________________

SUBCONTRACTOR

Signature of Representative: __________________________

Printed Name and Title: ______________________________________________________

Firm’s Name: ________________________________________________________________

Federal Identification Number: ________________________________

Address: ___________________________________________________________________

____________________________________________________________________________

Telephone: __________________________ Date: __________________________
MBE Attachment 3B

MBE PRIME PROJECT PARTICIPATION CERTIFICATION

PLEASE COMPLETE AND SUBMIT THIS FORM TO ATTEST EACH SPECIFIC ITEM OF WORK THAT YOUR MBE FIRM HAS LISTED ON THE MBE PARTICIPATION SCHEDULE (ATTACHMENT __-1A) FOR PURPOSES OF MEETING THE MBE PARTICIPATION GOALS. THIS FORM MUST BE SUBMITTED WITHIN 10 WORKING DAYS OF NOTIFICATION OF APPARENT AWARD. IF THE BIDDER/OFFEROR FAILS TO RETURN THIS AFFIDAVIT WITHIN THE REQUIRED TIME, THE PROCUREMENT OFFICER MAY DETERMINE THAT THE BIDDER/OFFEROR IS NOT RESPONSIBLE AND THEREFORE NOT ELIGIBLE FOR CONTRACT AWARD.

Provided that _________________________________________________ (Prime Contractor’s Name) with Certification Number ___________ is awarded the contract in conjunction with Solicitation No. _______________________, such MBE Prime Contractor intends to perform with its own forces at least $___________ which equals to___% of the Total Contract Amount for performing the following products/services for the Contract:

<table>
<thead>
<tr>
<th>NAICS CODE</th>
<th>WORK ITEM, SPECIFICATION NUMBER, LINE ITEMS OR WORK CATEGORIES (IF APPLICABLE), FOR CONSTRUCTION PROJECTS, GENERAL CONDITIONS MUST BE LISTED SEPARATELY.</th>
<th>DESCRIPTION OF SPECIFIC PRODUCTS AND/OR SERVICES</th>
<th>VALUE OF THE WORK</th>
</tr>
</thead>
<tbody>
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</tr>
</tbody>
</table>

MBE PRIME CONTRACTOR

Signature of Representative: ____________________________________________

Printed Name and Title __________________________________________________

Firm’s Name: ____________________________________________________________

Federal Identification Number: _____________________________

Address: _____________________________________________________________

Telephone: ____________________________ Date: _________________________
MBE Attachment 4A
Minority Business Enterprise Participation
Prime Contractor Paid/Unpaid MBE Invoice Report

Report #: _______________________
Reporting Period (Month/Year): __________
Prime Contractor: Report is due to the MBE Liaison, by the 10th
of the month following the month the services were provided.
Note: Please number reports in sequence

Contract #: _______________________
Contracting Unit: _______________________
Contract Amount: _______________________
MBE Subcontract Amt: _______________________
Project Begin Date: _______________________
Project End Date: _______________________
Services Provided: _______________________

Prime Contractor: _______________________
Contact Person: _______________________
Address: _______________________
City: _______________________
State: _______________________
ZIP: _______________________
Phone: _______________________
Fax: _______________________
E-mail: _______________________

MBE Subcontractor Name: _______________________
Contact Person: _______________________
Phone: _______________________
Fax: _______________________

Subcontractor Services Provided:

List all payments made to MBE subcontractor named above
during this reporting period:

<table>
<thead>
<tr>
<th>Invoice #</th>
<th>Amount</th>
<th>Invoice #</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>$</td>
<td>1.</td>
<td>$</td>
</tr>
<tr>
<td>2.</td>
<td>$</td>
<td>2.</td>
<td>$</td>
</tr>
<tr>
<td>3.</td>
<td>$</td>
<td>3.</td>
<td>$</td>
</tr>
<tr>
<td>4.</td>
<td>$</td>
<td>4.</td>
<td>$</td>
</tr>
</tbody>
</table>

Total Dollars Paid: $ _______________________

List dates and amounts of any outstanding invoices:

<table>
<thead>
<tr>
<th>Invoice #</th>
<th>Amount</th>
<th>Invoice #</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>$</td>
<td>1.</td>
<td>$</td>
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<tr>
<td>2.</td>
<td>$</td>
<td>2.</td>
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<tr>
<td>3.</td>
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<tr>
<td>4.</td>
<td>$</td>
<td>4.</td>
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</tr>
</tbody>
</table>

Total Dollars Paid: $ _______________________

- If more than one MBE subcontractor is used for this contract, you must use separate 4A forms for each subcontractor.
- Information regarding payments that the MBE prime will use for purposes of meeting the MBE participation goals must be reported separately in Attachment 4B
- Return one copy (hard or electronic) of this form to the following address (electronic copy with signature and date is preferred):

Victoria Nellis
Towson University
Procurement Department
8000 York Road
Towson, MD 21252
MBE@towson.edu
Ph: 410-704-2697
Fax: 410-704-8233

Prime Contractor Signature: _______________________
(Required) Date: _______________________

(TOWSON UNIVERSITY)
MBE Attachment 4B

Minority Business Enterprise Participation
MBE Prime Contractor Report

<table>
<thead>
<tr>
<th>MBE Prime Contractor:</th>
<th>Contract #:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certification Number:</td>
<td>Contracting Unit:</td>
</tr>
<tr>
<td>Report #:</td>
<td>Contract Amount:</td>
</tr>
<tr>
<td>Reporting Period (Month/Year):</td>
<td>Total Value of the Work to the Self-Performed for purposes of Meeting the MBE participation goal/subgoals:</td>
</tr>
</tbody>
</table>

MBE Prime Contractor: Report is due to the MBE Liaison, by the 10th of the month following the month the services were provided.

Note: Please number reports in sequence

Contact Person:

Address:

City: 

State:  

ZIP:  

Phone:  

Fax:  

E-mail:  

<table>
<thead>
<tr>
<th>Invoice Number</th>
<th>Value of the Work</th>
<th>NAICS Code</th>
<th>Description of the Work</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Return one copy (hard or electronic) of this form to the following address (electronic copy with signature and date is preferred):

Victoria Nellis
Towson University
Procurement Department
8000 York Road
Towson, MD 21252

Phone: 410-704-2697
Fax: 410-704-8233

MBE@towson.edu

Signature:  

Date:  

(Required)
**MBE Attachment 5**

Minority Business Enterprise Participation

Subcontractor Paid/Unpaid MBE Invoice Report

---

<table>
<thead>
<tr>
<th>Report #:</th>
<th>Contract #:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting Period (Month/Year):</td>
<td>Contracting Unit:</td>
</tr>
<tr>
<td></td>
<td>Contract Amount:</td>
</tr>
<tr>
<td>Report is due by the 10th of the month following the month the services were provided.</td>
<td>MBE Subcontract Amt:</td>
</tr>
<tr>
<td></td>
<td>Project Begin Date:</td>
</tr>
<tr>
<td></td>
<td>Project End Date:</td>
</tr>
<tr>
<td></td>
<td>Services Provided:</td>
</tr>
</tbody>
</table>

---

**MBE Subcontractor Name:**

**MDOT Certification #:**

**Contact Person:**

**Email:**

**Address:**

**City:**

**State:**

**ZIP:**

**Phone:**

**Fax:**

**E-mail:**

**Subcontractor Services Provided:**

---

**List all payments received from Prime Contractor during reporting period indicated above:**

<table>
<thead>
<tr>
<th>Invoice Amt.</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>$</td>
<td></td>
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<tr>
<td>$</td>
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<tr>
<td>$</td>
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<tr>
<td>$</td>
<td></td>
</tr>
</tbody>
</table>

**Total Dollars Paid: $**

**List dates and amounts of any unpaid invoices over 30 days old:**

<table>
<thead>
<tr>
<th>Invoice Amt.</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>$</td>
<td></td>
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<td>$</td>
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<td>$</td>
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<td>$</td>
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</tr>
</tbody>
</table>

**Total Dollars Paid: $**

**Prime Contractor:**

**Contact Person:**

---

**Signature:**

(Required)

**Date:**

---

Victoria Nellis  
Towson University Procurement Dept.  
MBE@towson.edu  
Phone: 410-704-2697  
Fax: 410-704-8233
COMPANY PROFILE

COMPANY NAME: ____________________________________________________________

DATE OF INCORPORATION: ___________ STATE OF INCORPORATION: ________________

TYPE OF WORK PERFORMED: __________________________________________________

___________________________________________________________________________

NUMBER OF YEARS IN BUSINESS: ______________________________________________

OTHER OR FORMER NAMES UNDER WHICH YOUR ORGANIZATION HAS OPERATED:
___________________________________________________________________________

TYPE OR ORGANIZATION: (I.E., CORP., PARTNERSHIP, INDIVIDUAL, JOINT VENTURE, OTHER):
___________________________________________________________________________

NAME OF PRINCIPAL(S) AND TITLE(S): ___________________________________________

___________________________________________________________________________

___________________________________________________________________________

BRIEF HISTORY OF COMPANY: ________________________________________________

___________________________________________________________________________

___________________________________________________________________________

TOTAL NUMBER OF EMPLOYEES: ______________________________

NUMBER OF FIELD EMPLOYEES (Excluding Supervisory): _________________________

NUMBER OF FIELD SUPERVISORY PERSONNEL: _________________________________

NUMBER OF OFFICE PERSONNEL (Excluding Supervisory): _________________________

NUMBER OF OFFICE SUPERVISORY PERSONNEL: _________________________________

BONDING CO.: ___________________________ BONDING CAPACITY: ________________
EXHIBIT G
FIRM EXPERIENCE

Duplicate as necessary to provide all required experience.

PROPOSER: ____________________________

PROJECT NAME: ________________________

PROJECT DOLLAR SIZE: __________________

START DATE: __________________________

COMPLETION DATE: ______________________

CLIENT/CUSTUMER: _____________________

ADDRESS: ______________________________

CONTACT PERSON: _______________________

TELEPHONE NUMBER: ____________________

FAX NUMBER: __________________________

EMAIL: _________________________________

PROJECT MANAGER: _____________________

BRIEF, BUT DETAILED DESCRIPTION OF THE PROJECT:

------------------------------------------------------------------

SIMILARITIES BETWEEN THIS PROJECT AND TU PROJECT:

------------------------------------------------------------------
EXHIBIT H
BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, __________________________ (Bidding Company) as Principal, hereinafter called the Principal, and __________________________ (Bonding Company) as Corporation duly organized under the laws of the State of __________________________, as Surety, hereinafter called the Surety, are held and firmly bound unto the State of Maryland, hereinafter called “State,” for the sum of __________________________ Dollars (or $ __________________________), for the payment of which sum, the said Principal and the said Surety bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for __________________________

(Identify project by number and brief description)

NOW, THEREFORE, if the Principal, upon acceptance by the State of its bid identified above, within the period specified therein for acceptance (ninety (90) days, if no period is specified), shall execute such further contractual documents, if any, and give such bond(s) as may be required by the terms of the bid as accepted within the time specified (ten (10) days if no period is specified) after receipt of the forms, or in the event of failure so to execute such further contractual documents and give such bonds, if the Principal shall pay the State the difference not to exceed the penalty hereof between the amount specified in the Principal’s bid and such larger amount for which the State may in good faith contract with another party to perform the work covered by said bid, then the above obligation shall be void and of no effect.

The Surety executing this instrument hereby agrees that its obligation shall not be impaired by any extension(s) of the time for acceptance of the bid that the Principal may grant to the State, notice of which extension(s) to the Surety being hereby waived; provided that such waiver of notice shall apply only with respect to extensions aggregating not more than ninety (90) calendar days in addition to the period originally allowed for acceptance of the bid.

In Presence of: Witness

____________________________ as to

____________________________ as to

____________________________ as to

____________________________ as to

In Presence of: Witness

____________________________ as to

____________________________ as to

____________________________ as to

Attest:

____________________________ as to

____________________________ as to

____________________________ as to

____________________________ as to

Individual Principal

________________________________

(Name)

____________________________ (SEAL)

Partnership Principal

________________________________

(Name)

____________________________ (SEAL)

Partner

____________________________ (SEAL)

Partner

____________________________ (SEAL)

Partner

____________________________ (SEAL)

Partner

________________________________

(Name of Corporation)
_______________________________
CORPORATE Secretary

Attest:

_______________________________
(Surety)

_______________________________
CORPORATE Secretary

Bonding Agents Name ______________________

Agent’s Address _______________________

Approved as to form and legal sufficiency
this _____ day of ________________________, 20____

Associate University Counsel

AFFIX

By: ________________________________
President SEAL

AFFIX

By: ________________________________
Attorney-in-fact SEAL
EXHIBIT I
PERFORMANCE BOND

Principal

Business Address of Principal

Surety

Obligee

a corporation of the State of ______________________
and authorized to do business in the State of Maryland

STATE OF MARYLAND
By and through the following Administration
TOWSON UNIVERSITY

Penal Sum of Bond (express in words and figures)

Description of Contract

Date of Contract

Date Bond Executed

Contract Number

KNOW ALL MEN BY THESE PRESENTS, That we, the Principal named above and Surety named above, being authorized to do business in Maryland, and having business addresses as shown above, are held and firmly bound unto the Obligee named above in the Penal Sum of this Performance Bond stated above, for the payment of which Penal Sum we bind ourselves, our heirs, executors, administrators, personal representatives, successors, and assigns, jointly and severally, firmly by these presents. However, where Surety is composed of corporations acting as co-sureties, we, the co-sureties, bind ourselves, our successors and assigns, in such Penal Sum jointly and severally as well as severally only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each co-surety binds itself, jointly and severally with the Principal, for the payment of such sum as appears above its name below, but if no limit of liability is indicated, the limit of such liability shall be the full amount of Penal Sum.

WHEREAS, Principal has entered into or will enter into a contract with the State of Maryland, by and through the Administration named above acting for the State of Maryland, which contract is described and dated as shown above, and incorporated herein by reference. The contract and all items incorporated into the contract, together with any and all changes, extensions of time, alterations, modifications, or additions to the contract or to the work to be performed thereunder or to the Plans, Specifications, and Special Provisions, or any of them, or to any other items incorporated into the contract shall hereinafter be referred to as “the Contract.”

WHEREAS, it is one of the conditions precedent to the final award of the Contract that these presents be executed.

NOW, THEREFORE, during the original term of said Contract, during any extensions thereto that may be granted by the Administration, and during the guarantee and warranty period, if any, required under the Contract, unless otherwise stated therein, this Performance Bond shall remain in full force and effect unless and until the following terms and conditions are met:

1. Principal shall well and truly perform the Contract; and
2. Principal and Surety shall comply with the terms and conditions contained in this Performance Bond.

Whenever Principal shall be declared by the Administration to be in default under the Contract, the Surety may, within 15 days after notice of default from the Administration, notify the Administration of its election to either promptly proceed to remedy the default or promptly proceed to complete the contract in accordance with and subject to its terms and conditions. In the event the Surety does not elect to exercise either of the above stated options, then the Administration thereupon shall have the remaining contract work completed, Surety to remain liable hereunder for all expenses of completion up to but not exceeding the penal sum stated above.

The Surety hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the Specifications accompanying the same shall in any way affect its obligations on this Performance Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work or to the Specifications.

This Performance Bond shall be governed by and construed in accordance with the laws of the State of Maryland and any reference herein to Principal or Surety in the singular shall include all entities in the plural who or which are signatories under the Principal or Surety heading below.

IN WITNESS WHEREOF, Principal and Surety have set their hands and seals to this Performance Bond. If any individual is a signatory under the Principal heading below, then each such individual has signed below on his or her own behalf, has set forth below the name of
the firm, if any, in whose name he or she is doing business, and has set forth below his or her title as a sole proprietor. If any partnership or joint venture is a signatory under the Principal heading below, then all members of each such partnership or joint venture have signed below, each member has set forth below the name of the partnership or joint venture, and each member has set forth below his or her title as a general partner, limited partner, or member of joint venture, whichever is applicable. If any corporation is a signatory under the Principal or Surety heading below, then each such corporation has caused the following: the corporation’s name to be set forth below, a duly authorized representative of the corporation to affix below the corporation’s seal and to attach hereto a notarized corporate resolution or power of attorney authorizing such action, and each such duly authorized representative to sign below and to set forth below his or her title as a representative of the corporation. If any individual acts as a witness to any signature below, then each such individual has signed below and has set forth below his or her title as a witness. All of the above has been done as of the Date of Bond shown above.

In Presence of:
Witness
_________________________ as to ______________________ (SEAL)

In Presence of:
Witness
_________________________ as to ______________________ (SEAL)

Co-Partnership Principal
_________________________ as to ______________________ (SEAL)

Co-Partnership Name

_________________________ as to ______________________ (SEAL)

_________________________ as to ______________________ (SEAL)

_________________________ as to ______________________ (SEAL)

Corporate Principal

_________________________ as to ______________________ (SEAL)

Name of Corporation

Attest:
_________________________ By: ______________________ CORPORATE SEAL

Corporate Secretary

_________________________ President with Title

_________________________ Surety

_________________________ By: ______________________ CORPORATE SEAL

Attest:
_________________________ Signature

Title: ______________________

Bonding Agent’s Name: ______________________

Business Address of Surety

Agent’s Address: ______________________

Approved as to legal form and sufficiency this _____ day of ________, 20____

_______________________________________________________

                      Director of Procurement
EXHIBIT J
PAYMENT BOND

Principal _________________________________________________________________

Surety _________________________________________________________________

a corporation of the State of ________________________

and authorized to do business in the State of Maryland

Business Address of Principal ______________________________________________

Obligee _________________________________________________________________

STATE OF MARYLAND

By and through the following Administration

TOWSON UNIVERSITY

Penal Sum of Bond (express in words and figures)

Description of Contract ________________________________________________

Date of Contract __________, 20____

Date Bond Executed __________, 20____

Contract Number _______________________________________________________

KNOW ALL MEN BY THESE PRESENTS, That we, the Principal named above and Surety named above, being authorized to do business in Maryland, and having business addresses as shown above, are held and firmly bound unto the Obligee named above, for the use and benefit of claimants as hereinafter defined, in the Penal Sum of this Payment Bond stated above, for the payment of which Penal Sum we bind ourselves, our heirs, executors, administrators, personal representatives, successors, and assigns, jointly and severally, firmly by these presents. However, where Surety is composed of corporations acting as co-sureties, we, the co-sureties, bind ourselves, our successors and assigns, in such Penal Sum jointly and severally as well as severally only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each co-surety binds itself, jointly and severally with the Principal, for the payment of such sum as appears above its name below, but if no limit of liability is indicated, the limit of such liability shall be the full amount of the Penal Sum.

WHEREAS, Principal has entered into or will enter into a contract with the State, by and through the Administration named above acting for the State of Maryland, which contract is described and dated as shown above, and incorporated herein by reference. The contract and all items incorporated into the contract, together with any and all changes, extensions of time, alterations, modifications, or additions to the contract or to the work to be performed thereunder or to the Plans, Specifications, and Special Provisions, or any of them, or to any other items incorporated into the contract shall hereinafter be referred to as “the Contract.”

WHEREAS, it is one of the conditions precedent to the final award of the Contract that these presents be executed.

NOW, THEREFORE, the condition of this obligation is such that if the Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and materials furnished, supplied and reasonably required for use in the performance of the Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect, subject to the following conditions:

1. A claimant is defined to be any and all of those persons supplying labor and materials (including lessors of the equipment to the extent of the fair market value be thereof) to the Principal or its subcontractors and subcontractors in the prosecution of the work provided for in the Contract, entitled to the protection provided by Section 9-113 of the Real Property Article of the Annotated Code of Maryland, as from time to time amended.

2. The above named Principal and Surety hereby jointly and severally agree with the Obligee that every claimant as herein defined, who has not been paid in full may, pursuant to and when in compliance with the provisions of the aforesaid Section 9-113, sue on this Bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant and have execution thereon. The Obligee shall not be liable for the payment of any costs or expenses of any such suit.
The Surety hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the Specifications accompanying the same shall in any way affect its obligations on this Payment Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work or to the Specifications.

This Payment Bond shall be governed by and construed in accordance with the laws of the State of Maryland and any reference herein to the Principal or Surety in the singular shall include all entities in the plural who or which are signatories under the Principal or Surety heading below.

IN WITNESS WHEREOF, Principal and Surety have set their hands and seals to this Payment Bond. If any individual is a signatory under the Principal heading below, then each such individual has signed below on his or her own behalf, and has set forth below the name of the firm, if any, in whose name he or she is doing business, and has set forth below his or her title as a sole proprietor. If any partnership or joint venture is a signatory under the Principal heading below, then all members of each such partnership or joint venture have signed below, each member has set forth below the name of the partnership or joint venture, and each member has set forth below his or her title as a general partner, limited partner, or member of joint venture, whichever is applicable. If any corporation is a signatory under the Principal or Surety heading below, then each such corporation has caused the following: the corporation's name to be set forth below, a duly authorized representative of the corporation to affix below the corporation's seal and to attach hereto a notarized corporate resolution or power of attorney authorizing such action, and each such duly authorized representative to sign below and to set forth below his or her title as a representative of the corporation. If any individual acts as a witness to any signature below, then each such individual has signed below and has set forth below his or her title as a witness. All of the above has been done as of the Date of Bond shown above.

In Presence of:
Witness

Individual Principal
__________________________ as to __________________________ (SEAL)

In Presence of:
Witness

Co-Partnership Principal
__________________________ (SEAL)
Name of Co-Partnership
__________________________ as to __________________________ (SEAL)
__________________________ as to __________________________ (SEAL)
__________________________ as to __________________________ (SEAL)

Corporate Principal

Attest:
______________________________________________
Corporate Secretary

By:__________________________ (SEAL)
President with Title

Surety

Attest:
__________________________ (SEAL)
__________________________ (SEAL)
Signature

Title: __________________________

Bonding Agent's Name: __________________________

Agent's Address: __________________________

Approved as to legal form and sufficiency this ____ day of ________, 20____

Director of Procurement
EXHIBIT K
ADDENDA ACKNOWLEDGMENT

NAME OF BIDDER: ____________________________________________

SOLICITATION NUMBER: ______________________________________

PROJECT TITLE: ______________________________________________

DUE DATE: ____________________________________________________

ACKNOWLEDGMENT

I hereby acknowledge receipt of the following addenda which have been issued regarding the above referenced solicitation:

Addendum #1, issue date ____________________________
Addendum #2, issue date ____________________________
Addendum #3, issue date ____________________________
Addendum #4, issue date ____________________________
Addendum #5, issue date ____________________________
Addendum #6, issue date ____________________________
Addendum #7, issue date ____________________________
Addendum #8, issue date ____________________________
Addendum #9, issue date ____________________________
Addendum #10, issue date ____________________________

__________________________________________  __________________________
Signature                                          Printed Name

__________________________________________  __________________________
Title                                               Company

__________________________________________
Date
EXHIBIT L
KEY PERSONNEL FORM

SOLICITATION/CONTRACT TITLE: ____________________________________________

SOLICITATION/CONTRACT NUMBER: _______________________________________

1. BIDDER/OFFEROR NAME: _____________________________________________

2. KEY PERSONNEL NAME: _______________________________________________

3. POSITION TO BE ASSIGNED: Check applicable
   _____ Project Manager          _____ Other. Title ___________________________
   _____ Field Superintendent

4. EDUCATIONAL BACKGROUND:

   Institution                  Degree/Diploma/ Certification     Major (if any)    Date of Degree
   _______________________________________________________________
   _______________________________________________________________
   _______________________________________________________________

5. EMPLOYMENT HISTORY. If key personnel have more than three (3) previous employers, provide
   complete employment history via supplemental page(s) attached to this form.

5.1 CURRENT EMPLOYER: _________________________________________________

   DATES OF EMPLOYMENT: ________________________________________________
   POSITIONS HELD                                                      DURATION BY DATE
   _________________________________________________________________
   _________________________________________________________________

5.2 PRIOR EMPLOYER: _________________________________________________

   DATES OF EMPLOYMENT: ________________________________________________
   POSITIONS HELD                                                      DURATION BY DATE
   _________________________________________________________________
   _________________________________________________________________

NOTE: If space provided is insufficient, attach additional page(s) and indicate “See attached.”
5.3 PRIOR EMPLOYER: ________________________________

DATES OF EMPLOYMENT: ________________________________

POSITION(S) HELD DURATION BY DATE

____________________________________________________________________________

____________________________________________________________________________

6. PROJECT REFERENCES. Furnish reference data for project owners/clients for specific projects to which key personnel were assigned. References from projects listed on Attachment A are preferred.

6.1 CONTACT PERSON: ____________________________ TELEPHONE #: ______________

COMPANY NAME: ________________________________

EMAIL ADDRESS: ________________________________

DESCRIPTION OF CONTRACT/PROJECT: ________________________________

6.2 CONTACT PERSON: ____________________________ TELEPHONE #: ______________

COMPANY NAME: ________________________________

EMAIL ADDRESS: ________________________________

DESCRIPTION OF CONTRACT/PROJECT: ________________________________

6.3 CONTACT PERSON: ____________________________ TELEPHONE #: ______________

COMPANY NAME: ________________________________

EMAIL ADDRESS: ________________________________

DESCRIPTION OF CONTRACT/PROJECT DONE: ________________________________

7. ACHIEVEMENTS/OTHER NOTATIONS (Optional):

____________________________________________________________________________

____________________________________________________________________________

8. SIMILAR PROJECT/CONTRACT EXPERIENCE. Complete a separate *Attachment A to Key Personnel Form for all key personnel proposed. At a minimum, include Project Manager and, if applicable, Field Superintendent(s). List at least three (3) prior projects for each.

NOTE: If space provided is insufficient, attach additional page(s) and indicate “See attached.”
EXHIBIT L – *ATTACHMENT A

8. SIMILAR PROJECT/CONTRACT EXPERIENCE

KEY PERSONNEL NAME: ____________________________________________ BIDDER OFFEROR NAME: ____________________________________________

ROLE TO BE ASSIGNED (check one): PROJECT MANAGER _____ FIELD SUPERINTENDENT _____ OTHER _____ Title: ____________________________________________

<table>
<thead>
<tr>
<th>PROJECT NAME/LOCATION</th>
<th>PROJECT DESCRIPTION</th>
<th>KEY PERSONNEL ROLE</th>
<th>PROJECT VALUE</th>
<th>START AND COMPLETION DATES (MM/YY-MM/YY)</th>
<th>OWNER/CLIENT CONTACT/TELEPHONE #</th>
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</table>

Note: List a minimum of three (3) projects for all key personnel proposed.
# General Conditions for Construction and Maintenance Contracts

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SECTION 1 - DEFINITIONS AND RESPONSIBILITIES

1.01 DEFINITIONS

A. “Contract.” The written agreement executed between the University and Contractor, covering performance of the work and furnishing of labor, services, equipment, and materials, and by which Contractor is bound to perform the work and furnish the labor, services, equipment and materials, and by which the University is obligated to compensate Contractor at the established and accepted rate or price. The contract documents shall include the proposal, contract forms and bonds, general conditions, specifications, addenda, supplemental specifications, all special provisions, all technical provisions, all plans, and notice to proceed; also any written change orders and supplemental agreements that are required to complete the work in an acceptable manner, including authorized extensions thereof.

B. “Contractor.” The person or organization having a direct contractual relationship with the University for execution of the Work. If Contractor hereunder is comprised of more than one legal entity, each such entity shall be jointly and severally liable under the Contract.

C. “Contract Time and Completion Date.” The number of working or calendar days shown in the proposal indicating the time allowed for the completion of the work contemplated in the contract. In case a calendar date of completion is shown in the proposal, in lieu of the number of working or calendar days, such work shall be completed on or before that calendar date.

D. “Day.” Means calendar day unless otherwise designated.

E. “Towson University” or “the University.” Refers to Towson University, an agency and instrumentality of the State of Maryland. In particular, the University refers to the campus or administrative unit of the University or its authorized representative that issues information relative to a particular transaction.

F. “Notice to Proceed.” A written notice to Contractor of the date on or before which it shall begin the prosecution of the work to be done under the Contract.

G. “Procurement Officer.” The person identified at the work initiation conference and designated by the University to make decisions with respect to administration of the work.

H. “Repair.” Where used in the Contract documents repair shall mean to restore after injury, deterioration, or wear; to mend, to renovate by such means as appropriate, and to supply such materials and labor as necessary to render the item to be repaired sound, solid, true, plumb, square, even, smooth and fully serviceable. Upon completion, such repair must be, unless otherwise stated, rendered to such condition as to present a first-class finished work, or in instances where the repaired item serves as a base for additional finish, the repaired work must be such as to permit a first-class finish, to be applied without extra cost to the University. When the word "repair" is used in connection with machinery or mechanical equipment it shall mean, in addition to the above, rendering the equipment completely serviceable and efficient, ready for normal use for which it was intended originally.
I. “Owner” or “State” or “University.” The State of Maryland acts only through its Board of Public Works. No action or representation is binding upon the State or Towson University unless it is made by, ratified by, or delegated by the Board of Public Works. Actions or representations made by the University staff do not bind the State or the University unless so provided in law.

J. “Subcontractor.” As employed herein includes only those having a direct contract with the Contractor. It includes one who furnishes material worked to a special design according to the plans and specifications for the Work, but excludes one who merely furnishes material not so worked.

K. “Supplemental Agreement.” A written agreement covering added or changed work which is beyond the scope of the contract and the changes clause. A supplemental agreement becomes a part of the contract when approved and properly executed by all parties to the contract.

L. “Surety.” The corporate body bound with and for Contractor for the full and complete performance of the Contract and payment of all debts pertaining to the Work.

M. “Work.” Work shall be understood to mean the furnishing of all labor, materials, equipment, services, utilities and other incidentals necessary to successful completion of the project and all the duties and obligations imposed upon Contractor by the Contract.

N. “Written Notice.” Shall be deemed to have been duly served if delivered in person to the individual or to the member of the firm or to an office of the corporation to whom it is intended, or if delivered to or sent by registered mail, to the last business address known to him who gives notice.

1.02 OWNER RESPONSIBILITIES

A. To the best of its abilities, the University will provide all relevant information relating to the project’s buildings, structures, and their nearby utility infrastructure, including underground utilities. This information is not guaranteed to be accurate, however, and must be field verified by the Contractor through inspection, investigation, utility locating, etc. MISS UTILITY will not locate underground utilities on University property.

B. Information or services under the Owner’s control shall be furnished by the University with reasonable promptness to avoid delay in the orderly progress of the Work.

1.03 CONTRACTOR RESPONSIBILITIES

A. Contractor shall supervise and direct the work using his best skill and attention, and shall be solely responsible for all construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the Work under the Contract.

B. Contractor shall be responsible to the University for the acts and omissions of Contractor employees, subcontractors and their agents and employees, and other persons performing any of the Work under the Contract.
C. Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents by inspections, tests, or approvals required or performed by persons other than Contractor.

D. Contractor shall confine operations at the site to areas permitted by law, ordinances, permits, and the Contract Documents, and shall not unreasonably encumber the site with any materials or equipment.

E. Contractor shall design and coordinate its installation with sensitivity to aesthetics, particularly where exterior systems or components must be installed in a prominent location. The University has the right to reject or amend intended installations that are not considered within the intent of this guidance.

F. Cutting and Patching of Work
   1. Contractor shall be responsible for all cutting, fitting, or patching that may be required to complete the Work or to make its several parts fit together properly in a workmanlike manner. Contractor shall clearly show on his installation drawings the locations proposed to be cut, penetrated, or otherwise altered, and provide details as to their final closure or condition.
   2. Contractor shall not damage or endanger any portion of the Work or the work of the University or any separate contractors by cutting, patching or otherwise altering any work or by excavation. Contractor shall not cut or otherwise alter the work of the University or any separate contractor except with the written consent of the University and of such separate contractor. Contractor shall not unreasonably withhold from the University or any separate contractor its consent to cutting or otherwise altering the Work.

G. Indemnification
   1. To the fullest extent permitted by law, Contractor shall indemnify, defend and hold harmless the University, the State of Maryland, Baltimore County, (if requested by the University), and their agents and employees from and against all claims, damages, losses, and expenses, including but not limited to attorney's fees, arising out of or resulting from the performance of the Work, provided that any such claim, damage, or loss or expense: (1) is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom, and (2) is caused in whole or in part by any act or omission of Contractor, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any one of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or otherwise exist as to any party or person described in this paragraph.
   2. In any and all claims against the University or the State of Maryland or any of their agents or employees by any employee of Contractor, 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 Contractor or any subcontractor under workers’ compensation acts, disability benefit acts, or other employee benefit acts.

H. Security

1. Doors to the work areas and/or buildings shall be kept locked before, during and after normal work hours, except as necessary to provide reasonable access to the Work.

2. Contractor will provide, when necessary, temporary closures at door, window, and louver openings to secure the area and building from theft, damage, and weather.

3. Contractor shall be responsible for the security of the work area, and security deficiencies in the work area shall be immediately corrected as required by the University.

4. The TU Project Manager may, at his/her discretion, issue keys or access cards to Contractor for the duration of the job or require Contractor to sign out keys/cards at Facilities Management’s Work Control Office on a daily basis. Contractor must request access to other areas through the TU Project Manager. At closeout, Contractor must return all keys or access cards to the TU Project Manager. Contractor will be held responsible for all expenses related to the replacement of lost keys and all lock cylinders that can be opened with lost keys.

SECTION 2 - CONTRACT DOCUMENTS

2.01 CONTRACT DOCUMENTS

A. The Contract Documents are complementary unless specified otherwise in the solicitation notice; that which is called for by any one document shall be as binding as if called for by all.

1. Intent of the documents is to include all work necessary for proper completion of the project, ready for continual efficient operation. It is not intended, however, to include any work not properly inferable.

2. Clarification. Contractor shall obtain clarification of all questions as to intent of the Contract Documents, or any conflict between two or more items in the Contract Documents. If Contractor fails to obtain such clarification, University may direct that the Work proceed by any method indicated, specified, or required by the Contract Documents in the interest of maintaining the best construction practice, and such direction shall not constitute the basis of Contractor claims for extra costs.

3. Jargon. Work described in words that have a well-known technical or trade meaning shall be held to refer to such recognized standard use.
B. **University-Provided Drawings.** All University-provided drawings are given for general information only. These drawings reflect the as-built conditions of the buildings/structure and the campus infrastructure to the best of the University's knowledge. The University cannot guarantee the accuracy of this information. Contractor shall inspect, investigate, and verify all field conditions prior to submission of its proposal.

C. **Contractor Drawings.** Contractor shall do no work without proper drawings and/or instructions that have been approved by the University. Drawings in general shall be drawn to scale and symbols used to indicate materials and architectural, structural, mechanical, and electrical requirements. Contractor shall keep on the job site a complete set of all drawings, specifications, shop drawings, schedules, etc., in good order and available to the University.

D. **Dimensions.** Contractor shall carefully check all dimensions prior to execution of the particular work affected and, if inaccuracies or discrepancies are found, consult the University prior to any construction or demolition. Dimensions for items to be fitted into constructed conditions at the job will be taken at the job and will be the responsibility of Contractor. The obvious intent of the documents, and obvious requirements dictated by conditions existing or being constructed, supersedes dimensions or notes that may be in conflict therewith. Whenever a stock size manufactured item or piece of equipment is specified by its normal size, it is Contractor’s responsibility to determine the actual space requirements for setting or entrance to the setting space. No extra will be allowed by reason of work requiring adjustments in order to accommodate a particular item of equipment.

2.02 **SHOP DRAWINGS**

A. Contractor shall submit for approval shop drawings, including setting drawings, and schedules as required by the University for the work of the various trades. These drawings shall be prepared in conformity with the best practice and standards for the trade concerned, with due regard for speed and economy of fabrication and erection.

B. All shop drawings must show the name of the project and the University contract number.

C. **Size of Drawings.** All shop drawings and details submitted for approval shall be printed on 24” x 36” drawing sheets or larger. Shop detail supplied on letter size (8 1/2” x 11”) sheets are acceptable for schedules and small details. An electronic copy is also required.

D. **Items For Which Shop Drawings Will Be Required.** Shop drawings are required for all items specifically fabricated for the Work, or when assembly of several items is required for a working unit. They must also be provided showing all points of connection, fastening, anchorage, cutting, penetrating, altering, etc. of any existing surfaces.

E. **Copies Required.** Contractor shall supply two (2) paper copies for the University’s Office of Facilities Management, in addition to such copies as Contractor may desire to be returned for its own use. An electronic copy shall also be submitted.
F. Examination and Approval. The University will examine shop drawings with reasonable promptness, noting desired corrections or granting approval or rejecting them.

G. Field Dimensions and Conditions. Contractor is solely responsible for the check of dimensions or existing conditions in the field.

H. Resubmission. When the University notes corrections or rejects shop drawings, Contractor shall resubmit with corrective changes.

SECTION 3 - SCOPE OF WORK

3.01 INTENT OF THE CONTRACT DOCUMENTS

It is the intent of the Contract Documents to show all of the work necessary to complete the project.

3.02 GENERAL CONDITIONS CONTROLLING

In event of a conflict between these General Conditions and any other provision of the Contract Documents, these General Conditions shall prevail unless such other provision expressly provides to the contrary.

3.03 DIFFERING SITE CONDITIONS

A. Contractor shall promptly, and before such conditions are disturbed, notify the Procurement Officer in writing of: (1) Subsurface or latent physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this contract. The Procurement Officer shall promptly investigate the conditions, and if he finds that such conditions materially differ and cause an increase or decrease in the cost of, or the time required for, performance of any part of the Work under this Contract, whether or not changed as a result of such conditions, an equitable adjustment shall be made and the contract modified in writing accordingly.

B. No claim by Contractor under this clause shall be allowed unless Contractor has given the notice required in A. above, provided, however, the time prescribed therefore may be extended by the University.

3.04 SITE INVESTIGATION

Contractor acknowledges that it has investigated and satisfied itself as to the conditions affecting the Work, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, river stages, tides or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment, and facilities needed preliminary to and during prosecution of the work. Contractor further acknowledges that it has satisfied itself as to the character, quality and quantity of surface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the University, as well as from information
presented by the drawings and specifications made a part of this contract. Any failure by Contractor to acquaint itself with the available information will not relieve it of responsibility for estimating properly the difficulty of cost of successfully performing this work. The University assumes no responsibility for any conclusions or interpretations made by Contractor on the basis of the information made available by the University.

3.05 CONDITIONS AFFECTING THE WORK

Contractor shall be responsible for taking steps reasonably necessary to ascertain the nature and location of the work or the cost thereof. Any failure by Contractor to do so will not relieve it of responsibility for successfully performing the work without additional expense to the University. Contractor agrees not to place any credence in any understanding or representation concerning conditions made by any University employee or agent prior to the execution of this contract, unless such understanding or representation is expressly stated in the contract.

3.06 CHANGES IN THE WORK [Intentionally omitted; see Exhibit A-2, Section 20]

SECTION 4 - CONTROL OF THE WORK

4.01 CONFORMITY WITH CONTRACT REQUIREMENTS

All work performed and all materials furnished shall be in conformity with the contract requirements.

4.02 ADJACENT WORK

A. The University shall have the right, at any time, to contract for and/or perform other work on, near, over, or under the work covered by this contract. In addition, other work may be performed under the jurisdiction of another state agency. Contractor shall cooperate fully with such other contractors and carefully fit its own work to such other work as may be directed by the University.

B. Contractor agrees that in event of dispute as to cooperation or coordination with adjacent contractors, the decision of the University will be binding. Contractor agrees to make no claims against the University or the State of Maryland for any inconvenience, delay, or loss attributable to the presence and operations of other contractors.

4.03 CONTROL BY THE CONTRACTOR

Contractor shall constantly maintain efficient supervision of the Work, using its best skill and coordinating ability. It shall carefully study and compare all drawings, specifications, and other instructions, and check them against conditions existing or being constructed on the project, and at once report any error, inconsistency, or omission discovered.

4.04 COOPERATION WITH UTILITIES

A. It is understood and agreed that Contractor has considered in its price all of the permanent and temporary utility appurtenances in their present or relocated
positions, and that no additional compensation will be allowed for normal delays, inconvenience, or damage sustained by him due to any interference, from the said utility appurtenances, the operation of moving them, or the making of new connections thereto if required by the contract documents.

B. Contractor shall be responsible for notifying all affected utility companies prior to performing any work on their utilities, and shall cooperate with them in achieving the desired results. Contractor shall be the responsible for all damage to utility facilities caused by Contractor's operations.

C. At points where Contractor's operations are adjacent to properties of railway, telegraph, telephone, water, and power companies, or are adjacent to other property, damage to which might result in expense, loss, or inconvenience, work shall not be commenced until Contractor makes all arrangements necessary for the protection thereof.

D. Contractor shall cooperate with owners of any underground or overhead utility lines in removal and rearrangement operations, so that these operations may progress in a reasonable manner, duplication or rearrangement is minimized, and services rendered by those parties are not unnecessarily interrupted.

E. In the event of interruption to utility services as a result of accidental breakage, or as a result of utility lines being exposed or unsupported, Contractor shall promptly notify the proper authority, and shall cooperate with said authority in restoration of service. No work shall be undertaken around fire hydrants until provisions for continued service are approved by the local fire authority.

F. Utility outages shall be kept to a minimum, and will be permitted only with the written approval of OFM. All requests for outages shall include identification of all areas to be affected by the proposed outage, and shall be made not less than 48 hours in advance of the need.

G. Contractor may use sanitary facilities located near the project site, if available. Should a nuisance in or an abuse of University facilities occur, and continue after notice from the University, then access to University facilities will be withdrawn, and Contractor shall provide its own facilities. Contractor shall keep all such facilities in clean and sanitary condition throughout the period of use, and repaint such facilities at the completion of the work, if required, at no cost to the University.

4.05 AUTHORITY AND DUTIES OF UNIVERSITY INSPECTORS

A. University inspectors are authorized to inspect all work done and all material furnished. Such inspections may extend to all or any part of the Work and to the preparation, fabrication, or manufacture of the materials to be used. The inspector is not authorized to revoke, alter, or waive any requirements of the contract, nor to approve or accept any portion of the complete project. He is authorized to call to Contractor’s attention any failure of the work or materials to conform to the Contract. He is authorized to reject materials or suspend the work until any questions or issues are resolved. Inspectors shall perform their duties at such times and in such times and in such manner as will not unnecessarily impede progress on the Contract.
B. Inspector shall in no case act as foreman, or perform other duties for Contractor, nor interfere with management of the work by Contractor.

C. Any advice the inspector may give Contractor shall not be construed as binding the University in any way, or releasing Contractor from fulfilling the terms of the Contract. The duty of the inspector is to observe progress of the Work and report any deviations from the requirements of the Contract Documents; however, should the inspector fail to report any such deviation from the Contract requirements, Contractor is not released from its obligation to fulfill all terms of the Contract.

D. Where there is disagreement between Contractor and the inspector, the inspector will immediately direct the University's attention to the issues of disagreement, and if Contractor still refuses to make corrections, comply, or suspend work, the University will prepare and deliver in writing to Contractor a written order suspending the work. As soon as the inspector is advised of delivery of the shutdown order, the inspector shall immediately leave the site, and any work performed during the inspector's absence will not be accepted or paid for, and may be required to be removed and disposed of at Contractor expense.

4.06 INSPECTION OF THE WORK

A. All work, including the fabrication and source of supply, is subject to observation by the University and by those agencies required by law to inspect specific items.

B. Contractor shall provide facilities for access and inspection as required by the University.

C. If the specifications, the University's instructions, laws, ordinances, or any public authority require any work to be specially tested or approved, Contractor shall give the University timely notice of its readiness for inspection, and if the inspection is by another authority, the date fixed for such inspection. Inspections by the University shall be made promptly and, where practicable, at the source of supply. Any work covered without approval must, if required by the University, be uncovered for examination at Contractor's expense.

4.07 REMOVAL OF DEFECTIVE WORK

A. All work and materials that do not conform to the requirements of the Contract will be considered unacceptable.

B. Any unacceptable or defective work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause shall be removed and replaced by work and materials that conform to the contract requirements, or shall be remedied otherwise in an acceptable manner authorized by the University.

C. If Contractor fails to comply promptly with any order made under this section, the University shall cause defective or unacceptable work to be remedied or replaced, and unauthorized work to be removed, and shall hold Contractor responsible for the costs thereof.
4.08 MAINTENANCE OF WORK DURING CONSTRUCTION

A. Contractor shall maintain the work during construction and until acceptance. This maintenance shall be continuous and effective, and prosecuted with adequate equipment and forces to the end that all parts of the Work are kept in satisfactory condition at all times, and protected from damage of any kind from external sources.

B. Particular attention shall be given to drainage, both permanent and temporary. Contractor shall use all reasonable precautionary measures to avoid damage or loss that might result from accumulations and concentrations of drainage water, and material carried by such waters and such drainage shall be diverted or dispensed when necessary to prevent damage to excavation, embankments, surfaces, structures, or property. Contractor shall take suitable measures to prevent erosion in all construction areas where existing ground cover has been removed. All such measures shall be in compliance with the requirements of any governmental entity having jurisdiction.

C. All costs of maintenance during construction and before final acceptance shall be included in the bid price; Contractor will not be paid additional amounts for such work.

D. If Contractor's work is halted by the University for failure to comply with the Contract, Contractor shall maintain the entire project as provided herein, and provide such ingress and egress for local residents or tenants adjacent to the project site, for tenants of the project site, and for the general public as may be necessary during the period of suspended work, or until Contractor has been declared in default.

E. On projects where traffic flow is maintained, Contractor shall be responsible for repair and restoration of all traffic damage to the work, either partially or totally completed, until the University accepts the work.

4.09 FAILURE TO MAINTAIN ENTIRE PROJECT

Contractor's failure to comply with Section 4.4.08 shall result in notice by the University to comply with the required maintenance provisions. If Contractor fails to remedy unsatisfactory maintenance within 24 hours after receipt of such notice, the University will immediately proceed to maintain the project, and the entire cost of this maintenance will be charged to Contractor.

4.10 UNIVERSITY'S RIGHT TO DO WORK

If Contractor fails to prosecute the Work properly or to perform any provision of the Contract, the University, after three (3) days' written notice to Contractor, may make good such deficiencies and deduct the cost thereof from the monies then or thereafter due to Contractor.

4.11 PARKING (See also Section 12.02)

A. Parking is allowed in only designated areas. Parking on sidewalks or unpaved areas is prohibited at all times.
B. All vehicles parked on Towson University property must strictly observe University parking regulations. Each vehicle parked on campus between 6 am and 8 pm, Monday through Thursday, and from 6 am to 3 pm on Fridays, must display a valid University permit unless parked at a paid meter. All fines for parking or other vehicle violations are the responsibility of Contractor.

C. This section applies to vendors, salespersons, company vehicles, and contractor employees’ personal vehicles. Long- and short-term permits are available, at designated rates, for vendors with contracts that require them to park regularly on the campus; see the parking website at http://wwwnew.towson.edu/adminfinance/auxservices/parking/ for permit rates and information to support preparation of bids and price proposals.

SECTION 5 - MATERIALS

5.01 GENERAL

A. All materials shall meet all quality requirements of the Contract. To expedite inspection and testing of materials, Contractor shall notify the University, in writing, of the sources from which Contractor proposes to obtain materials requiring approval, testing, inspection, or certification prior to incorporation into the work, as soon possible after notice of contract award.

B. Materials include all manufactured products and processed and unprocessed natural substances required for completion of the Contract. Contractor, in accepting the Contract, is assumed to be thoroughly familiar with the materials required and their limitations as to use, and requirements for connection, setting, maintenance, and operation. Whenever an article, material, or equipment is specified and a fastening, furring, connection (including utility connections), access hole, flashing closure piece, bed, or accessory is normally considered essential to its installation in good quality construction, such shall be included as if fully specified. Nothing in the specifications shall be interpreted as authorizing any work in a manner contrary to applicable laws, codes, or regulations.

C. Approval. All materials are subject to University approval for conformity with the specifications, quality, design, color, etc. No work for which approval is necessary shall be used until written approval is given. Approval of a subcontractor or supplier does not constitute approval of materials other than those included in the specifications.

D. New Materials. Unless otherwise specified, all materials shall be new. Old materials must not be used as substitutes for new, regardless of condition or repair, unless approved in writing by the University.

E. Quality. Unless otherwise specified, all materials shall be of the best quality of the respective kinds.

F. Samples. Contractor shall furnish all samples for approval as directed. Materials used shall be the same as the approved samples.
G. **Proof of Quality.** Contractor shall, if requested, furnish satisfactory evidence of the kind and quality of materials, either before or after installation, and shall pay for tests deemed necessary for substitutions as set forth in paragraph 5.03 of these General Conditions.

H. **Standard Specifications.** When no specification is cited and the quality, processing, composition, or method of installation of a thing is only generally referred to, then:

1. For items not otherwise specified below, the latest edition of the applicable American Society for Testing and Materials (ASTM) specification applies.
2. For items generally considered as plumbing and those items requiring plumbing connections, the applicable portions of the latest edition of the BOCA Code apply.
3. For items generally considered as heating, refrigeration, air conditioning, or ventilating, the applicable portions of the latest edition of the ASHRAE Handbook published by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., apply.
4. For items generally considered as site work, the applicable portions of the Maryland State Highway Administration (SHA) Standard Specifications apply.
5. For items generally considered as electrical, the applicable provisions of the latest edition of the National Electrical Code apply.
6. For items generally considered as fire protection, the applicable portions of the latest edition of the National Fire Protection Association (NFPA) code apply.

I. Contractor is solely responsible for safeguarding its tools, materials, and equipment at the work site and elsewhere on the campus. The University shall not assume responsibility for vandalism and/or theft of Contractor materials, tools, or equipment.

J. Existing equipment and materials removed from the project shall become the property of the Contractor, who shall be responsible for removing same from the campus, absent a written agreement with the University. Contractor shall be responsible for proper handling of all materials removed for the purpose of recycling or salvage. Salvaged materials shall not be released to University staff without written approval from the Associate Vice President for Facilities Management. Under no circumstances shall Contractor provide salvage service on behalf of or for the benefit of University employees.

K. No asbestos, lead, or PCB-containing materials shall be used or installed on campus without prior written approval from the University's Department of Environmental Health & Safety (410-704-2949).

5.02 **STORAGE AND HANDLING OF MATERIALS**

A. Materials shall be stored and handled so as to assure the preservation of their quality and acceptability for the work. Stored materials, even though approved before
storage, may again be inspected prior to their use in the work. Stored materials shall be located so as to facilitate prompt inspection. Though not guaranteed, limited areas of the University may be used for some storage of materials and equipment, depending on the site location, time of the year, and the quantity of material/equipment; such storage areas shall be restored to their original condition at Contractor expense.

B. Contractor shall confine his tools and equipment and the storage of materials to the area designated by the TU Project Manager, and will not load or permit any part of the structure to be loaded with a weight that will endanger the safety of the structure or any part thereof.

C. Explosives

1. Explosives shall not be stored anywhere on University property.

2. Contractor may use explosives only upon written approval from the University. Approval will stipulate the time, place, and quantity of explosives to be used, and the manner of use.

3. Contractor assumes all responsibility for injury to persons or damage to property damage resulting from the use or transportation of explosives, and for complying with any and all ordinances, regulations, and restrictions related to the use of explosives.

D. Paints

1. Contractor shall not store oil-based paints or flammable liquids on the project site in containers larger than five (5) gallon size. Any liquid with a flash point of less than one hundred (100) degrees shall be contained in UL-approved safety cans; liquids with higher flash points shall be stored in rigid cans. Glass containers shall not be used.

2. Contractor shall remove all oily rags, waste, etc. from the work site at the close of each working day.

5.03 TESTS

A. If the Contract Documents, laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested, or approved, Contractor shall give timely notice of its readiness so the University may observe such inspection, testing, or approval. Contractor shall bear all costs of such inspections, tests, or approval conducted by public authorities.

B. If the University determines that any work requires special inspection, testing, or approval in addition to that required by the Contract Documents, Contractor will, upon written authorization from the University, order such special inspection, testing, or approval, and give notice as provided in 5.06 A above. If such special inspection or testing reveals that work does not comply with the Contract, Contractor shall bear all costs of testing; otherwise the University shall bear such costs.
C. Contractor shall promptly secure all required certificates of inspection, testing, or approval and promptly delivered same to the University.

5.04 BUY AMERICAN STEEL

Only steel products made in the United States shall be used or supplied in the performance of the contract or any subcontract thereunder. Steel products include products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated, or otherwise similarly processed from steel made in the United States. This requirement shall not apply if the University determines that the cost of such steel products is unreasonable or inconsistent with the public interest. The provisions of this paragraph shall not apply where they are in conflict with any Federal grant or regulation affecting this contract.

SECTION 6 - LEGAL RELATIONS AND RESPONSIBILITIES

6.01 LAWS TO BE OBSERVED

A. Contractor shall keep fully informed of all federal, state, and local laws, ordinances, and regulations, and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the Work, or in which any way affect the conduct of the Work. He shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees. He shall protect and indemnify the University and its representatives against such claim or liability arising from or based on the violation of any law, ordinance, regulation, order, or decree, whether by himself or his employees or subcontractors.

B. Contractor must comply with the provisions of the Workmen's Compensation Act and federal, state, and local laws relating to hours of labor.

C. The provisions of the Contract shall be governed by the Laws of Maryland.

D. Contractor shall give all notices and comply with all state and federal laws, ordinances, rules, and regulations bearing on the conduct of the Work as drawn and specified.

E. If Contractor observes that the drawings and specifications are at variance with any law, he shall promptly notify the University, and make all necessary changes as provided in the contract for changes in the work. If Contractor performs any Work knowing it to be contrary to such laws, ordinances, rules, and regulations, and without such notice to the University, he shall bear all costs arising therefrom.

6.02 PERMITS AND LICENSES [Intentionally omitted]

6.03 PATENTED DEVICES, MATERIALS, AND PROCESSES [Intentionally omitted; see Exhibit A-2, Section 26]

6.04 LAND, AIR, AND WATER POLLUTION

A. Contractor shall incorporate all permanent erosion control features into the work at the earliest practicable time. Temporary pollution control measures will be used to
correct unforeseen conditions that develop during construction, that are needed prior to installation of permanent pollution control features, or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

B. Contractor is advised that temporary pollution control may include measures outside the project site, where such work is necessary as a direct result of project construction. Contractor shall keep the University advised of all such off-site control measures undertaken; however, this shall not relieve Contractor of basic responsibilities for such work.

C. If Contractor fails to control erosion pollution and/or siltation, the University reserves the right to employ outside assistance or to use its own forces to provide the necessary corrective measures. All expenses incurred by the University in the performance of such duties for Contractor shall be the responsibility of Contractor.

D. Contractor must submit evidence to the University that governing federal, state, and local air pollution criteria are met. This evidence and related documents will be retained by the University.

E. If the performance of all or any part of the work is suspended, delayed, or interrupted by order of a court of competent jurisdiction as a result of environmental litigation as defined below, the Procurement Officer, at the request of Contractor, shall determine whether the order is due in any part to the acts or omissions of Contractor required by the University under the terms of the contract. If it is determined that the order is due in any part to acts or omissions of Contractor required by the Procurement Officer in the administration of the Contract, such suspension, delay, or interruption shall be considered as if ordered by the Procurement Officer under the Suspension of Work clause of the contract. The period of such suspension, delay, or interruption shall be considered reasonable, and an adjustment shall be made for any increase in the cost of performance of the contract (excluding profit) as provided that clause, subject to all the provisions thereof.

F. The term "environmental litigation" as used herein means a lawsuit alleging that the work will have an adverse effect on the environment, or that the University has not duly considered, either substantively or procedurally, the effect of the work on the environment.

6.05 CONTRACTOR'S LIABILITY INSURANCE

A. Contractor and each subcontractor shall maintain such insurance as will protect from claims under Workmen's Compensation Act, and the Federal Longshoremen's and Harbor Workers' Compensation Act, and the Federal Employers Liability Act by coverage with insurance companies or by methods acceptable to the State Insurance Commissioner and by no other method, for damages which may arise from operations under this contract, whether such operations be by Contractor or by any subcontractor or anyone directly or indirectly employed by either. All insurance except Workmen’s Compensation shall name the Towson University, the University System of Maryland, and the State of Maryland as additional insureds.
B. Contractor shall protect itself, the University, and the State from any claims for bodily injury, liability, and property damage liability.

C. Limits for bodily injury liability shall be not less than $1,000,000/2,000,000; i.e., $1,000,000 is the limit for injury per occurrence and $2,000,000 in the aggregate. The minimum limit for property damage liability shall be $1,000,000 per accident and $2,000,000 aggregate.

D. The above policies for bodily injury and property damage liability insurance shall be so written as to include contingent bodily injury and property damage liability insurance to protect Contractor against claims from the operations of subcontractors.

E. Contractor's certificates of insurance containing evidence of the Hold Harmless Clause protecting the University and the State of Maryland shall be filed with the Procurement Officer and shall be subject to approval for adequacy of protection. No work shall be started at the site until appropriate certificates of insurance are filed with and approved by the Procurement Officer.

6.06 FIRE AND EXTENDED COVERAGE INSURANCE [Intentionally omitted; see Exhibit A-2, Section 38]

6.07 ASSIGNMENT [Intentionally omitted; see Exhibit A-2, Section 28]

6.08 SEPARATE CONTRACTS

A. The University reserves the right to let other contracts in connection with this Work. Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their Work, and shall properly connect and coordinate his Work with theirs.

B. If any part of Contractor's work depends for proper execution or results upon the work of any other contractor, Contractor shall inspect and promptly report any defects in such work that render it unsuitable for such proper execution and results. Failure to so inspect and report shall constitute acceptance of the other contractor's work as fit and proper for the reception of Contractor's work, except as to the defects that may develop in the other contractor's Work after the execution of Contractor's work.

C. To insure proper execution of his subsequent work, Contractor shall measure work already in place and shall at once report to the University any discrepancy between the executed work and the drawings.

6.09 RELATIONSHIP OF CONTRACTOR TO PUBLIC OFFICIALS AND EMPLOYEES

A. In carrying out any of the provisions of the Contract, or in exercising any power or authority granted to them by or within the scope of the Contract, there shall be no liability upon the Procurement Officer or other authorized representatives of the University, it being understood that in all such matters they act solely as agents and representatives of the University.
B. The University may terminate the Contractor’s right to proceed under the Contract if the Procurement Officer finds that gratuities (in the form of entertainment, gifts, or otherwise) were offered or given by Contractor or any agent or representative of Contractor to any officer or employee of the University with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending or the making of any determinations with respect to the performing of such contract. The facts upon which the Procurement Officer makes such findings may be reviewed in any competent court.

C. In the event the Contract is terminated as provided in paragraph B above, the University shall be entitled (1) to pursue the same remedies against Contractor as it could pursue in the event of Contractor’s breach of the contract, and (2) in addition to any other damages to which it may be entitled by law, to exemplary damages in an amount (as determined by the Procurement Officer) which shall be not less than three, nor more than ten times the costs incurred by Contractor in providing any such gratuities to any such officer or employee.

D. The rights and remedies of the University provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract.

E. Conflict of Interest. No official or employee of the State of Maryland whose duties as such official or employee include matters relating to or affecting the subject matter of this contract, shall, during the pendency and term of this Contract and while serving as an official or employee of the State, become or be an employee of Contractor or any subcontractor on this contract.

6.10 NO WAIVER OF LEGAL RIGHTS

A. The University and the State of Maryland shall not be precluded or estopped by any measurement, estimate, or certificate made either before or after the completion and acceptance of the work and payment therefore, from showing the true amount and character of the work performed and materials furnished by Contractor, or from showing that any such measurement, estimate, or certificate is untrue or is incorrectly made, or from showing that the Work or materials do not in fact conform to the requirements of the contract. The University and the State of Maryland shall not be precluded or estopped, notwithstanding any such measurement, estimate, or certificate, and payment from recovering from Contractor or his sureties, or both, such damage as it may sustain by reason of failure to comply with the terms of the Contract. Neither the acceptance by the University or any representative of the University, nor any payment for or acceptance of the whole or any part of the work, nor any extension of time, nor any possession taken by the University shall operate as a waiver of any portion of the contract or of any power herein reserved, or of any right to damages.

B. Waiver by the University of any breach of the Contract shall not be held to be a waiver of any other or subsequent breach.

6.11 COVENANT AGAINST CONTINGENT FEES [Intentionally omitted; see Exhibit A-2, Sec. 1]
6.12 ASSIGNMENT OF ANTITRUST CLAIMS

Contractor sells, transfers, and assigns to the University and the State of Maryland all rights, title, and interest of and in and to any causes of action arising at any time before the date of this assignment or during the performance of this contract under the Antitrust Laws of the United States, including Section 1 of the Sherman Act, and the Antitrust Law of Maryland relating to the purchase by him or the University or the State of Maryland of any products from any supplier or source whatever that are incorporated in structures built under the terms of this agreement. Contractor hereby certifies that the above causes of action are lawfully owned and that no previous assignment of same, has been made nor has the same heretofore been attached or pledged in any manner whatsoever.

6.13 FEDERAL PARTICIPATION [Intentionally omitted]

6.14 DISPUTES [Intentionally omitted; see Exhibit A-2, Section 27]

6.15 CLAIMS

A. Under no circumstances will overhead or profit be permitted as items of a claim, when such overhead or profit is for periods during which a "Stop Work" order is in effect due to an act, error, omission for which the contractor is responsible.

B. No profit or overhead that includes rental of equipment and the salaries of supervisory personnel will be allowed Contractor for stoppage of work when written notice of such stoppage, or impending stoppage, is not given sufficiently far in advance to prevent such stoppage.

C. No claim will be granted that includes cost of delays or work stoppage due to strikes lockouts, fire, unusually severe weather, avoidable casualties, or damage or delay in transportation for which the University or its agents are responsible; only time extensions, in accordance with Section 7.03 will be granted.

D. Contractor and the University agree that no prejudgment or post-judgment interest on any claims asserted by either party will be allowed.

E. No claim for damage caused by a delay will be allowed unless, within five (5) days of the act or omission causing the delay, Contractor notifies the University of the existence of the delay.

SECTION 7 - PROSECUTION AND PROGRESS OF THE WORK

7.01 NOTICE TO PROCEED

After the Contract has been executed, the University will issue Contractor a "Notice to Proceed" that stipulates the date on or before which Contractor is expected to begin work. The specified contract time shall begin on the day work (other than the erection of the inspector's office, construction stakeout, and mobilization) actually starts, or on the day stipulated in the Notice to Proceed, whichever is earlier. Any preliminary work started or materials ordered before receipt of Notice to Proceed shall be at contractor's risk.
7.02 SIGNS

A. General. The University shall provide one project sign for each major entrance to the project. The contractor shall be responsible for placement and maintenance of the sign(s).

B. Installation. Posts for sign(s) shall be supplied by the contractor and made of 4 x 6 inch construction grade lumber, pressure-preservative treated, 10 feet long. The sign(s) shall be bolted to the posts using at least two 2 inch bolts per post. Washers shall be used between the bolts and the sign faces and the posts and nuts. The posts shall be set into the ground to a depth of three feet, six inches with the bottom of the signs two feet six inches above the ground.

C. Removal. The University shall be responsible for removing the sign(s) after final acceptance of the work.

7.03 PROSECUTION OF THE WORK

A. All time limits in the Contract Documents are of the essence of the Contract.

B. The date of commencement of the work is the date established in a Notice to Proceed signed by the Procurement Officer.

C. If Contractor is delayed at any time in the progress of the work by any act or neglect of the University or any of its officers, agents, or employees, or by any separate contractor employed by the University, or by any changes ordered in the work, or by labor disputes, fire, unusual delay in transportation, unavoidable casualties, or by any cause which the Procurement Officer determines may justify any delay, then the contract time shall be extended for such time as the Procurement Officer may authorize.

D. It is expressly understood and agreed by and between Contractor and the University that the time for the completion of the work is a reasonable time, taking into consideration average climatic range and usual business conditions prevailing in the locality of the project.

7.04 PUBLIC CONVENIENCE AND SAFETY

Contractor at all times shall conduct the work in such a manner as to create the least practicable obstruction to all forms of traffic. The convenience of the general public, tenants, and of the residents along and/or adjacent to the improvement shall be respected. Material stored upon the project shall be placed so as to cause a minimum of obstruction to the public. Contractor shall, unless otherwise specified, provide and maintain in passable condition such temporary access roads and bridges as may be necessary to accommodate traffic diverted from the project under construction, or using the project under construction, and shall provide and maintain in a safe condition temporary approaches to, and crossings of, the project. Existing facilities scheduled to be removed, but which might be of service to the public during construction, will not be disturbed until other and adequate provisions are made. Fire hydrants on or adjacent to the project shall be kept accessible to fire apparatus at all times, and no material or obstruction shall be placed within 15 feet of any such hydrant. Work closed down for the winter or at any other times shall be left entirely accessible at all
points to fire apparatus. All footways, gutters, sewer inlets, and portions of the project the work under construction shall not be obstructed more than is absolutely necessary.

7.05 BARRICADES AND WARNING SIGNS

A. Contractor shall provide, erect, and maintain all necessary barricades, suitable and sufficient lights, danger signals, signs, and other control devices, and shall take all necessary precautions for the protection of the work and safety of the public. All highways and other facilities closed to traffic shall be protected by effective barricades, and obstructions shall be illuminated during hours of darkness with electric lights.

B. Contractor shall erect warning signs in advance of any place on the project where its operations may interfere with vehicular or pedestrian traffic, and at all other points where the new work crosses or coincides with an existing roadway or traffic lane(s). Such warning signs shall be constructed and erected in accordance with the FHWA Manual on Uniform Traffic Control Devices, or as directed.

7.06 PRESERVATION PROTECTION AND RESTORATION OF PROPERTY

A. Contractor shall continuously maintain adequate protection of its work from damage, and shall protect University property from injury or loss arising in connection with the Contract. Contractor shall repair, and shall indemnify the University against any such damage, injury, or loss, except such as may be directly due to errors in the Contract Documents, or caused by agents or employees of the University. Contractor shall adequately protect adjacent property as provided by law, and by the Contract Documents.

B. Contractor shall box all trees that are liable to injury by the moving, storing, and working up of materials. He shall use no tree for any attachment or anchorage.

C. Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the Work, all necessary safeguards for the protection of workmen and the public, and shall post danger signs warning against the hazards created by such features of construction as protruding nails, hod hoists, well holes, elevator hatchways, scaffolding, window openings, stairways, and falling materials.

D. In any emergency affecting the safety of life or of the Work or of the adjoining property, Contractor, without special instruction or authorization, is permitted to act, at his discretion, to prevent such threatened loss or injury. If specifically instructed by the University to do work in an emergency, Contractor shall do the work and be compensated as outlined in Section 3.06.

7.07 PROGRESS SCHEDULE AND TIME

Preparation of Work Schedule. Contractor shall prepare a schedule setting forth dates for completing various portions of the work. Included among the tasks set forth on the schedule shall be the dates for submittals, and dates for the return of the approved submittals. The schedule shall be reviewed for approval of the time within which the University must evaluate Contractor submittals. Approval of Contractor's schedule does not constitute approval of the entire schedule, but merely an approval of that portion of the schedule that relates to the
review of submittals. If Contractor fails to prepare and submit to the University a schedule before the occurrence of a delay, then no claim for extra costs due to delay in the work shall be recognized or asserted.

7.08 PROGRESS PHOTOGRAPHS

Contractor shall submit to the University photographs, taken on or about the first of each month, showing the status of the Work. Contractor shall photograph all disputed items of work.

7.09 SUSPENSION OF THE WORK [Intentionally omitted; see Exhibit A-2, Section 63]

7.10 CONTRACTOR’S RIGHT TO STOP WORK OR TERMINATE CONTRACT

If the Work should be stopped under an order of any court, or other public authority, for a period of three (3) months, through no act or fault of the contractor, or of anyone employed by him, then Contractor may, upon seven (7) days’ written notice to the Procurement Officer, stop work or terminate this contract.

7.11 UNIVERSITY’S RIGHT TO TERMINATE FOR ITS CONVENIENCE [Intentionally omitted; see Exhibit A-2, Section 66]

7.12 TERMINATION FOR DEFAULT--DAMAGES FOR DELAY--TIME EXTENSIONS [Intentionally omitted; see Exhibit A-2, Sections 25 and 65]

7.13 PARTIAL ACCEPTANCE

A. If during the construction of work the University desires to occupy any portion of the project, the University shall have the right to occupy and use those portions of the project which, in the opinion of the Procurement Office, can be used for their intended purpose; provided that the conditions of occupancy and use are established and the responsibilities of Contractor and the University for maintenance, heat, light, utilities, and insurance are mutually agreed.

B. Partial occupancy shall in no way relieve Contractor of its responsibilities under the contract.

7.14 FAILURE TO COMPLETE ON TIME/LIQUIDATED DAMAGES

A. Time is an essential element of the Contract and the work shall be vigorously prosecuted until completion.

B. For each day that any work shall remain uncompleted beyond the time(s) specified elsewhere in the Contract, Contractor may be liable for liquidated damages in the amount(s) provided for in the solicitation, provided, however, that due account shall be taken of any adjustment of specified completion time(s) for completion of work as granted by approved change orders.
7.15 SUBSTANTIAL COMPLETION AND FINAL INSPECTION

A. When the work is substantially completed, the contractor shall notify the Procurement Officer that the work will be ready for final inspection and test on a definite date. Sufficient notice shall be given to permit the Procurement Officer to schedule the final inspection.

B. On the basis of the inspection, if the Procurement Officer determines that the work is substantially complete and the project can be occupied or used for its intended purpose, the Procurement Officer shall establish the date of substantial completion and shall state the responsibilities of the University and the contractor for maintenance, heat, utilities, and insurance, and shall fix the time for which the guarantee will begin.

7.16 CLEANING UP

Contractor shall at all times keep the construction area, including storage areas, free from accumulations of waste materials or rubbish and, prior to completion of the work, remove all rubbish from the premises and all tools, scaffolding, equipment, and materials not the property of the University. Contractor shall give special attention to any materials used on rooftops or exposed areas that may become windborne and be hazards, public nuisances, or litter on nearby grounds. Upon completion, Contractor shall leave the work and premises in a clean, neat, and workmanlike condition satisfactory to the Procurement Officer.

7.17 GUARANTEES

The contractor guarantees for a two (2) year period (unless another period is specified), commencing on the date fixed by the parties:

A. That the work contains no faulty or imperfect material or equipment or any imperfect, careless, or unskilled workmanship.

B. That all mechanical and electrical equipment, machines, devices, etc., shall be adequate for the use to which they are intended, and shall operate with ordinary care, and attention in a satisfactory and efficient manner.

C. That he will re-execute, correct, repair, or remove and replace with proper work, without cost to the University, any work found not be as guaranteed by this Section. The contractor shall also make good all damages caused to other work or materials in the process of complying with this Section.

D. That the entire work shall be water-tight and leak-proof in every particular.

7.18 NOTICE TO UNIVERSITY OF LABOR DISPUTES

A. Whenever the contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of this contract, the contractor shall immediately give notice thereof, including all relevant information with respect thereto, to the Procurement Officer.

B. The contractor agrees to insert the substance of this clause, including this Paragraph B., in any subcontract hereunder as to which a labor dispute may delay the timely
performance of this contract; except that each such subcontract shall provide that in the event its timely performance is delayed or threatened by delay by any actual or potential labor dispute, the subcontractor shall immediately notify his next higher tier subcontractor, or the prime contractor, as the case may be, of all relevant information with respect to such dispute.

SECTION 8 - PAYMENTS

8.01 CORRECTION OF WORK BEFORE COMPLETION

A. Contractor shall promptly remove from the premises all materials condemned as failing to conform to the contract, whether incorporated in the work or not. Contractor shall promptly replace and re-execute its own work in accordance with the contract and without expense to the University, and shall bear the expense of making good all work of other contractors destroyed or damaged by such removal or replacement.

B. If Contractor does not remove such condemned work and materials within a reasonable time, fixed by written notice, the University may remove and store the materials at Contractor expense. If Contractor does not pay the expense of such removal within ten (10) days thereafter, the University may, upon ten (10) days notice, sell such materials and shall account for the net proceeds thereof, after deducting all the costs and expenses that should have been borne by Contractor.

8.02 PAYMENT OF INTEREST [Intentionally omitted; see Exhibit A-2, Section 50]

8.03 AUDITS BY THE STATE

A. Contractor agrees that the State or any of its duly authorized representatives shall, until the expiration of three years after final payment under this contract have access to and the right to examine any directly pertinent books, documents, papers, and records of the contractor involving transactions related to this contract.

B. Contractor further agrees to include in all subcontracts hereunder a provision to the effect that the subcontractor agrees that the University or any of its duly authorized representatives shall, until the expiration of three years after final payment under the subcontract, have access to and the right to examine any directly pertinent books, documents, papers, and records of such subcontractor, involving transactions related to the subcontract.

SECTION 9 - EMPLOYEES, SUBCONTRACTORS A WORK CONDITIONS

9.01 EMPLOYEES AND WORKMANSHIP

A. Qualification of Employees. Contractor shall employ only personnel thoroughly trained and skilled in the tasks assigned on any portion of the work. Any employee found to be unskilled or untrained shall be removed from the work.
B. **Licensed Employees.** When municipal, county, state, or federal laws require that certain personal (electricians, plumbers, etc.) be licensed, all such personal employed on the work shall be so licensed.

C. **Quantity of Labor.** Contractor shall employ on the work, at all times, sufficient personnel to complete the work within the time stated in the contract.

D. **Work Areas.** Contractor shall confine the operations of his employees to the limits as provided by law, ordinance, permits, or directions of the University. Generally, the work area will be the same as the "Limit of Contract" line indicated in the construction documents.

E. **Methods and Quality**

1. All workmanship shall be of good quality. Where the method of work or manner of procedure is not specifically stated in the contract documents, it is intended that the best standard practice shall be followed. Recommendations of the manufacturers of approved materials shall be considered part of these specifications and all materials shall be applied, installed, connected, erected, used, cleaned, and conditioned as so called for thereby.

2. All materials shall be accurately, assembled, set, etc., and when so required in good construction, shall be true to line, even, square, plumb, level, and regularly spaced, coursed, etc. Under no circumstances, either in new or old work, shall any material be applied over another which has not been thoroughly cleaned, sanded, or otherwise treated so as not to impair the finish, adhesion, or efficiency of the next applied item.

F. **Scheduling**

1. Contractor shall so schedule the Work as to ensure efficient and uninterrupted progress, and to minimize cutting and patching of new Work. All cutting, patching, and digging necessary to the execution of the Work is included.

2. Contractor shall so schedule the construction performed by each group or trade that each installation or portion of the construction shall member with and join with every other new or old Work as required for a complete installation, all according to accepted good construction practice.

G. **Superintendent.** Contractor shall keep on the Work, at all times during its progress, a competent English-speaking superintendent and any necessary assistants, all approved by the University prior to commencement of the Work. Contractor shall submit in writing to the University the name of the person it intends to employ as superintendent for the execution of this contract, with a statement of the proposed superintendent's qualifications, to be reviewed by the University and approved or rejected in writing. Persons who have previously proved unsatisfactory on work executed for the University or the State of Maryland, or who lack sufficient qualifications, will not be approved, and this procedure will be repeated. A single Contractor Superintendent may superintend two or more jobs located at the same
institution or nearby only when approved by the University in writing. The Superintendent shall represent the contractor, and all directions given to the Superintendent shall be as binding as if given directly to the Contractor. Important directions shall be confirmed in writing to the Contractor. Other directions shall be so confirmed upon written request. A Superintendent who proves unsatisfactory to the University shall be removed from the work, and Contractor shall submit a new Superintendent for approval as described above.

H. Discipline. Contractor shall at all times enforce strict discipline and good order among his employees and shall not employ or permit to remain on the work any unfit person. He shall enforce all instructions relative to use of water, heat, power, no smoking, and control and use of fires as required by law, and the University. Employees must not be allowed to loiter on the premises before or after working hours.

9.02 NON-DISCRIMINATION EMPLOYMENT POLICIES [Intentionally omitted; see Exhibit A-2, Section 44]

9.03 SUBCONTRACTS

A. Contractor shall, as soon as practicable and before execution of the contract, notify the University, in writing, of the names of subcontractors proposed for the principal parts of the work, and shall not employ any to which the University may object as incompetent or unfit.

B. Contractor shall be as fully responsible to the University for the acts and omissions of subcontractors, and of persons either directly employed by them, as for the acts and omissions of persons directly employed by Contractor.

C. Nothing contained in the Contract Documents shall create any contractual relation between any subcontractor and the University and nothing in the contract documents is intended to make the subcontractor a beneficiary of the contract between the University and the contractor.

9.04 RELATION OF CONTRACTOR AND SUBCONTRACTOR

A. Contractor agrees to bind every subcontractor, and will see that every subcontractor agrees to be bound by the terms of the Agreement, the General Conditions, the Drawings, and Specifications as far as applicable to its work, unless specifically noted to the contrary in a subcontract approved in writing by the University.

B. Contractor agrees to include the following provision in all subcontracts and supply contracts applicable to the work:

1. Subcontractor agrees to be bound to Contractor by the terms of the Agreement, General Conditions, Drawings, and Specifications, and to assume toward him all obligations and responsibilities that Contractor, by those documents, assumes toward the University.

2. Subcontractor agrees, upon completion of its work, to promptly pay all labor, material suppliers, vendors, subcontractors, and others, to permit simultaneous final payment by Contractor.
C. Contractor agrees to be bound to subcontractor by all the obligations that the University assumes to the Contractor under the Agreement, General Conditions, Drawings, and Specifications, and by all the provisions thereof affording remedies and redress to the Contractor from the University.

1. To pay the subcontractor to such extent as may be provided by the contract documents or the subcontract;

2. To pay the subcontractor on demand for his work or materials as far as executed and fixed in place, less the retained percentage;

3. To pay the subcontractor a just share of any fire insurance money received by Contractor; and

4. To give the subcontractor an opportunity to be present and to submit evidence in any matter involving his rights.

D. Prompt Payment of Subcontractors: This contract is subject to the provisions of COMAR 21.10.08. Contractor shall promptly pay subcontractor any undisputed amount to which the subcontractor is entitled. In the event Contractor fails to pay promptly, subcontractors may request remedy in accordance with COMAR 21.10.08. Contractor shall include in each subcontract a clause that contains substantially the same provisions as this clause.

E. Contractor and subcontractor agree that nothing in this section shall create any obligation on the part of the University to pay to or to see to the payment of any sums to any subcontractor.

9.05 PREVAILING WAGE RATES

Please be advised that Prevailing Wage Rates prescribed by the Maryland Department of Labor, Licensing and Regulation (DLLR) will apply to this project. The project specific wage rate instructions are incorporated into these General Conditions for Construction/Maintenance Contracts as Attachment A – Prevailing Wage Rate Instructions.

9.06 CONSTRUCTION SAFETY AND HEALTH STANDARDS

It is a condition of the Contract and shall be made a condition of each subcontract that neither Contractor nor any subcontractor shall require any laborer or mechanic employed in performance of the contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to health or safety, as determined under construction safety and health standards, laws and regulations of the locality in which the work is done, the state, and the federal government.

SECTION 10 [Intentionally omitted]
SECTION 11 - ENVIRONMENTAL HEALTH AND SAFETY

11.01 STORM WATER POLLUTION PREVENTION/PROHIBITION OF ILLICIT DISCHARGES

No person shall cause or contribute discharge directly or indirectly into the Towson University municipal storm drain system or waterways any materials, including but not limited to pollutants or waters containing any pollutants that cause or contribute to a violation of applicable water quality standards, other than storm water.

Refer to **06-20.00 – University Policy on Storm Water Illicit Discharge Detection and Elimination** for additional information.

No person may improperly store, handle, use or apply any pollutant in a manner that will cause its exposure to rainfall, runoff and discharge into the Towson University municipal storm water drain system or campus waterways.

The commencement, conduct or continuance of any illegal discharge to the storm drain system is prohibited except as described:

A. The following discharges are exempt from discharge prohibitions:

   water line flushing or other potable water sources, landscape irrigation or lawn watering, diverted stream flows, rising ground water, ground water infiltration to storm drains, uncontaminated pumped ground water, foundation or footing drains (not including active groundwater dewatering systems), crawl space pumps, air conditioning condensation, springs, non-commercial washing of vehicles, natural riparian habitat or wet-land flows, swimming pools (if dechlorinated - typically less than one PPM chlorine), fire-fighting activities, and any other water source not containing pollutants.

B. Any discharges specified in writing by Towson University Environmental Health & Safety as being necessary to protect public health and safety.

C. Dye testing only with required verbal notification to Towson University Environmental Health & Safety [(410) 704-2949 or safety@towson.edu] prior to the time of the test.

D. The following discharges are exempt from discharge prohibitions: water line flushing or other potable water sources, landscape irrigation or lawn watering, diverted stream flows, rising ground water, ground water infiltration to storm drains, uncontaminated pumped ground water, foundation or footing drains (not including active groundwater dewatering systems), crawl space pumps, air conditioning condensation, springs, non-commercial washing of vehicles, natural riparian habitat or wet-land flows, swimming pools (if dechlorinated - typically less than one PPM chlorine), fire-fighting activities, and any other water source not containing pollutants.
11.02 PROHIBITION OF ILLICIT CONNECTIONS

The construction, use, maintenance or continued existence of illicit connections to the storm drain system is prohibited. This prohibition expressly includes, without limitation, any illicit connections made in the past. This is regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection. A person is considered to be in violation if the person connects a line conveying sewage to the MS4, or allows such a connection to continue.

11.03 NOTIFICATION OF SPILLS OR ILLICIT DISCHARGES

Notwithstanding other requirements by law, as soon as any contractor has information regarding any known or suspected release of materials that result or may result in illegal discharges or pollutants discharging into storm water, the storm drain system, campus waterways said person shall take all necessary steps to ensure the discovery, immediate containment, and cleanup of such release. In the event of a release of hazardous materials or upon observing an illicit environmental discharge immediately contact the Towson University Police Department (TUPD) at (410) 704-4444. In the event of a release of non-hazardous materials, notify Towson University Environmental Health & Safety in person or by phone [(410) 704-2949] or e-mail [safety@towson.edu] no later than the next business day. Notifications in person or by phone shall be confirmed by written notice addressed and mailed to Environmental Health & Safety, Towson University, 8000 York Road, Towson, MD 21252 within three business days of the phone notice.

11.04 ENFORCEMENT

A. Enforcement for student violators will follow the TU Office of Student Conduct and Civility Educations Code of Student Conduct.

B. Enforcement for University employees (Faculty and Staff) shall follow the Towson University Policy for discipline or termination Policy No. 07.05.25 – Disciplinary Action for Employees.

C. Enforcement for Visitors (Non-TU Faculty, Staff, Students or Contractors)

D. Individuals or Contractors, depending on the nature and severity of the violation, may be referred to MDE for prosecution for violation of federal and state laws and regulations.

E. Any fines, penalties, environmental monitoring or remediation expenses, etc., resulting from the illicit discharge, will be violator’s responsibility.

F. During normal University business hours (Monday-Friday, 8am-4pm), contact EHS at (410) 704-2949 to report violations.

G. If the violator is still on the scene, they should also immediately contact TUPD at (410) 704-4444.

H. After normal duty hours, weekends and holidays, contact TUPD at (410) 704-4444 to report violations.
SECTION 12: OFM SUPPLEMENTAL CONDITIONS

12.01 STORAGE OF MATERIALS

The University has very limited storage space for any materials or equipment and may not be able to meet Contractor’s requests for such depending on the site location, time of year, and amount of equipment/materials.

12.02 PARKING

Parking must be coordinated prior to commencement of work. Designated parking areas will be provided for limited construction-related vehicles close to the work site; these may also require a fee-based permit. Contractor employees may need to use remote off-campus parking and carpool to the construction site. Contractor shall be responsible for securing any necessary permits for designated areas, for the duration of the project. Vehicles other than construction-related vehicles are not permitted on campus; boats, trailers, campers, etc. will be towed immediately, at vehicle owner’s expense.

12.03 INSPECTIONS

Inspections will be performed by the appropriate agencies as specified in the Contract documents. Towson University and independent inspection agencies, as required, will perform most required inspections. Other agencies that may be required for inspection are:

- Maryland Department of the Environment (MDE)
- State Fire Marshall

12.05 AMERICANS WITH DISABILITIES ACT (ADA) COMPLIANCE

All work performed shall be in compliance with current ADA regulations. Contractor shall notify the Owner of any deficiencies in design bearing on ADA compliance, prior to commencement of work.

12.06 VEHICULAR ACCESS

Contractors will use only the vehicle access routes approved by OFM prior to commencement of the project. Under no circumstances shall Contractor park or drive motor vehicles on grass or landscaped areas. Contractor shall bear all costs of repair or replacement of areas damaged by its vehicles.

12.07 CONTRACTOR MOTOR VEHICLES

Under no circumstances shall a contractor vehicle exceed 15 mph while on university property. Pedestrians have right of way at all times, with no exceptions. Any Contractor vehicle over 1 ton shall have operational back-up signals. Flat beds, box trailers and all 18-wheel vehicles shall be accompanied by an assistant during the back-up process to ensure the safety of pedestrians and property in the path of the vehicle.
12.08 CONTRACTOR'S EMPLOYEE BEHAVIOR

Contractor is responsible for its employees' behavior at all times. Unprofessional behavior will not be tolerated and will be cause for immediate removal of the employee(s) from campus property. Contractor employees should refrain from unsolicited conversation with the general campus public.

12.09 NOISE RESTRICTIONS

Due to the close proximity of residential communities and hospitals to University property, noise limitations are imposed during certain hours. Normal work hours (7:00am - 5:00pm) are not limited except as may be specified in regard to the adjacent classroom building schedules. When Contractor anticipates work before or after normal hours, it shall confirm with the University's Project Manager that the work to be accomplished is within acceptable noise limits.

12.10 ELECTRICAL/MECHANICAL TIE-IN

Contractor shall coordinate all electrical and mechanical tie-ins through the University Project Manager at least 72 hours in advance. Contractor shall not enter any electrical panel for inspection, installation, or otherwise without the consent of the Project Manager. Where Contractor anticipates mechanical tie-in, he shall verify with the University Project Manager that existing valves and other control systems are functional. The University plumbing shop shall drain down all mechanical equipment.

12.11 WORK HOURS. Normal work hours shall be as follows:

- Weekdays: 7:00am - 4:00pm
- Weekends: 7:00am - 4:00pm, with written authorization
- Holidays: Only with advanced authorization

Deviations from normal work hours must be requested from the University's Project Manager not less than 72 hours prior to the start of anticipated work.

12.12 RADIOS

Playing of radios, CD players, etc. is not permitted on any construction site.

12.13 MAINTENANCE OF PROPERTY

Contractor is solely responsible for maintaining, at its expense, all property within the Limit of Disturbance (L.O.D.) or the established construction fence, which ever has the greater perimeter, including:

A. Cutting grass to a maximum 4" height and, where a construction or safety fence exists; trimming both sides.

B. Establishing and maintaining safety fence at the drip line of all trees and shrubs marked to remain.
C. Maintaining clean walkways and entrances to trailers used as site offices.

12.14 CONTRACT AND ADMINISTRATIVE PROTOCOL

Contractor and all contractor representatives shall clearly understand and strictly adhere to the following University protocols prior to work commencement:

A. All coordination between Contractor and Owner shall be through the University’s designated Project Manager. At no time shall Contractor request or demand support or assistance from the University’s maintenance department, trades shops, or grounds department. Failure to observe this protocol shall result in dismissal of Contractor’s superintendent from the site.

B. Coordination for submission of administrative and contractual documents shall be as outlined in pre-construction or work initiation meeting.
REQUEST FOR ADVERTISEMENT AND NOTICE TO PROCEED

Michelle Compton - Procurement Officer
Towson University
8000 York Road
Towson, MD 21252

Re: Prettyman & Scarborough Bathroom Renovation
Project No: TU-1942-SBR

Enclosed please find the Prevailing Wage Determination and Instructions for Contractors for the project referenced above.

Upon advertisement for bid or proposal of this project, you are requested to submit to this office the date and name of publication in which such advertisement appeared.

Once awarded, you are further directed to submit to this office, the NOTICE TO PROCEED for the project, complete with the date of notice, the name of the general contractor, and the dollar amount of the project. In addition, we ask that a representative of the prevailing wage Unit be invited to attend the Pre-Construction Conference.

Any questions concerning this matter may be referred to PrevailingWage@dllr.state.md.us

Sincerely,

Enclosures
Wage Determination
Instruction for the Contractor

Prevailing Wage Unit
The contractor shall electronically submit completed copies of certified payroll records to the Commissioner of Labor & Industry, Prevailing Wage Unit by going on-line to https://www.dllr.state.md.us/prevwage and following the instructions for submitting payroll information (NOTE: A contractor must register prior to submitting on-line certified payroll information).

If you have technical questions regarding electronic submittal, contact the Department at didlpervailingwage-dllr@maryland.gov.

All certified payroll records shall have an accurate week beginning and ending date. The contractor shall be responsible for certifying and submitting to the Commissioner of Labor and Industry, Prevailing Wage Unit all of their subcontractors’ payroll records covering work performed directly at the work site. By certifying the payroll records, the contractor is attesting to the fact that the wage rates contained in the payroll records are not less than those established by the Commissioner as set forth in the contract, the classification set forth for each worker or apprentice conforms with the work performed, and the contractor or subcontractor has complied with the provisions of the law.

A contractor or subcontractor may make deductions that are (1) required by law; (2) required by a collective bargaining agreement between a bona fide labor organization and the contractor or subcontractor; or (3) contained in a written agreement between an employee and an employer undertaken at the beginning of employment, if the agreement is submitted by the employer to the public body awarding the public work and is approved by the public body as fair and reasonable.

A contractor or subcontractor is required to submit information on-line on their fringe benefit packages including a list of fringe benefits for each craft employed by the contractor or subcontractor, by benefit and hourly amount. Where fringe benefits are paid in cash to the employee or to an approved plan, fund, or program, the contribution is required to be indicated.

Payroll records must be electronically submitted and received within 14 calendar days after the end of each payroll period. If the contractor is delinquent in submitting payroll records, processing of partial payment estimates may be held in abeyance pending receipt of the records. In addition, if the contractor is delinquent in submitting the payroll records, the contractor shall be liable to the contracting public body for liquidated damages. The liquidated damages are $10.00 for each calendar day the records are late.

Only apprentices registered with the Maryland Apprenticeship and Training Council shall be employed on prevailing wage projects. Apprentices shall be paid a percentage of the determined journey person’s wage for the specific craft.

Overtime rates shall be paid by the contractor and any subcontractors under its contracts and agreements with their employees which in no event shall be less than time and one-half the prevailing hourly rate of wages for all hours worked in excess of ten (10) hours in any one calendar day; in excess of forty (40) hours per workweek; and work performed on Sundays and legal holidays.

Contractors and subcontractors employing a classification of worker for which a wage rate was not issued SHALL notify the Commissioner of Labor & Industry, Prevailing Wage Unit, for the purpose of obtaining the wage rate for said classification PRIOR TO BEING EMPLOYED on the project. To obtain a prevailing wage rate which was NOT listed on the Wage Determination, a contractor or subcontractor can look on the DLLR webpage under prevailing wage.

Contractors and subcontractors shall maintain a valid copy of proper State and county licenses that permit the contractor and a subcontractor to perform construction work in the State of Maryland. These licenses must be retained at the worksite and available for review upon request by the Commissioner of Labor and Industry’s designee.

**Each contractor under a public work contract subject to Section 17-219 shall:**

1. Post a clearly legible statement of each prevailing wage rate to be paid under the public work contract; and
2. Keep the statement posted during the full time that any employee is employed on the public work contract.
3. The statement of prevailing wage rates shall be posted in a prominent and easily accessible place at the site of the public work.
**Penalty - Subject to Section 10-1001 of the State Government Article, the Commissioner may impose on a person that violates this section a civil penalty of up to $50.00 per violation.**

Under the Maryland Apprenticeship and Training Council requirements, consistent with proper supervision, training and continuity of employment and applicable provisions in collective bargaining agreements, a ratio of one journey person regularly employed to one apprentice shall be allowed. No deviation from this ratio shall be permitted without prior written approval from the Maryland Apprenticeship and Training Council.

Laborers may NOT assist mechanics in the performance of the mechanic’s work, NOR USE TOOLS peculiar to established trades.

ALL contractors and subcontractors shall employ only competent workers and apprentices and may NOT employ any individual classified as a HELPER or TRAINEE on a prevailing wage project.

The State Apprenticeship and Training Fund (Fund) law provides that contractors and certain subcontractors performing work on certain public work contracts are required to make contributions toward apprenticeship. See §17-601 through 17-606, State Finance and Procurement, Annotated Code of Maryland. Contractors and subcontractors have three options where they can choose to make their contributions: (1) participate in a registered apprenticeship training program; (2) contribute to an organization that has a registered apprenticeship training program; or (3) contribute to the State Apprenticeship and Training Fund.

The Department of Labor, Licensing and Regulation (DLLR) is moving forward with final adoption of regulations. The regulations were published in the December 14, 2012 edition of the Maryland Register.

**IMPORTANT: Please note that the obligations under this law will become effective on JULY 1, 2013. This law will require that contractors and certain subcontractors make contributions toward apprenticeship and report those contributions on their certified payroll records that they submit pursuant to the prevailing wage law.**

The Department is offering outreach seminars to any interested parties including contractors, trade associations, and any other stakeholders. Please contact the Department at dlliprevailingwage-dllr@maryland.gov or (410) 767-2968 for seminar times and locations. In addition, information regarding this law will be provided at pre-construction meetings for projects covered by the Prevailing Wage law.

For additional information, contact:
Division of Labor and Industry
Maryland Apprenticeship and Training
1100 North Eutaw Street, Room 606
Baltimore, Maryland 21201
(410) 767-2246
E-Mail Address: matp@dllr.state.md.us.
The wage rates to be paid laborers and mechanics for the locality described below is announced by order of Commissioner of Labor and Industry.

It is mandatory upon the successful bidder and any subcontractor under him, to pay not less than the specific rates to all workers employed by them in executing contracts in this locality. Reference: Annotated Code of Maryland State Finance and Procurement, Section 17-201 thru 17-226.

These wage rates were taken from the locality survey of 2018 for Baltimore County, issued pursuant to the Commissioner's authority under State Finance and Procurement Article Section 17-209, Annotated Code of Maryland or subsequent modification.

**Note: If additional Prevailing Wage Rates are needed for this project beyond those listed below, contact the Prevailing Wage Unit. Phone: (410) 767-2342, email: prevailingwage@dllr.state.md.us.

Name and Title of Requesting Officer: Michelle Compton - Procurement Officer
Department, Agency or Bureau: Towson University
Project Number: TU-1942-SBR
Location and Description of work: Baltimore County: Renovate the bathrooms in the Prettyman & Scarborough dorms.

Date of Issue: Jan 29, 2019

BUILDING CONSTRUCTION

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FRINGE REFERENCES AS NOTED:


b. PAID VACATIONS: Employees with 1 year service - 1 week paid vacation; 2 years service - 2 weeks paid vacation; 10 years service - 3 weeks paid vacation.

Incidental Craft Data: Caulker, Man Lift Operator, Rigger, Scaffold Builder, and Welder receive the wage and fringe rates prescribed for the craft performing the operation to which welding, scaffold building, rigging, operating a Man Lift, or caulking is incidental.
These **Informational Prevailing Wage Rates** may not be substituted for the requirements of pre-advertisement or onsite job posting for a public work contract that exceeds $500,000 in value and either of the following criteria are met: (1) the contracting body is a unit of State government or an instrumentality of the State and there is any State funding for the project; or (2) the contracting body is a political subdivision, agency, person or entity (such as a county) and the State funds 50% or more of the project.

**Modification Codes:**

(AD) 17-209 Annual Determination from Survey Wage Data Received  
(CH) 17-211 Commissioners’ Hearing  
(CR) 17-208 Commissioners’ Review  
(SR) 17-208 Survey Review by Staff

Each "Borrowed From" county is identified with the FIPS 3-digit county code unique for the specific jurisdiction in Maryland.

For additional information on the FIPS (Federal Information Processing Standard) code, see http://www.census.gov/datamap/fipslist/AllSt.txt

The Prevailing Wage rates appearing on this form were originally derived from Maryland’s annual Wage Survey. The Commissioner of Labor & Industry encourages all contractors and interested groups to participate in the voluntary Wage Survey, detailing wage rates paid to workers on various types of construction throughout Maryland.

A mail list of both street and email addresses is maintained by the Prevailing Wage Unit to enable up-to-date prevailing wage information, including Wage Survey notices to be sent to contractors and other interested parties. If you would like to be included in the mailing list, please forward (1) your Name, (2) the name of your company (if applicable), (3) your complete postal mailing address, (4) your email address and (5) your telephone number to PWMAILINGLIST@dllr.state.md.us. Requests for inclusion can also be mailed to: Prevailing Wage, 1100 N. Eutaw Street - Room 607, Baltimore MD 21201-2201.