PROJECT MANUAL COVER

"FOR BID"

PROJECT MANUAL FOR CONSTRUCTION OF

Renovations to Farthings Bathroom

(Building or Facility Name)

AT THE

47414 Old State House Road, St. Mary's City, Maryland 20686

(Institution)

St. Mary's City, **St. Mary's** Maryland

(City) (County)

FOR THE

Department of General Services

(Agency)

DGS PROJECT NO. **SM-850-230-002**

PROJECT CLASSIFICATION: **B**

06/03/2024

(Date)

STATE OF MARYLAND

DEPARTMENT OF GENERAL SERVICES

Atif T. Chaudhry, Secretary
301 West Preston Street
Baltimore, Maryland 21201

BOARD OF PUBLIC WORKS (Name)

Wes Moore, Governor
Brooke Lierman, Comptroller
Dereck Davis, Treasurer

MINORITY BUSINESS ENTERPRISES ARE ENCOURAGED TO RESPOND TO THIS SOLICITATION

Architect
Morris & Ritchie Associates, Inc.
1414 Key Highway, Suite M301, Baltimore, MD 21230

Mechanical/Electrical/Plumbing Engineer
Telegent Engineering, Inc.
2216 Commerce Road, Suite 1 Forest Hill, MD 21050

SECTION 000000
CONSULTANT REGISTRATION CERTIFICATIONS

Architect's Professional Certification	**Engineer's Professional Certification**	**Engineer's Professional Certification**
		
Rich L. Root, AIA, NCARB, LEED AP, Principal	Daniel T. Fuhrman	Timothy J. Smidt, PE
Date: 06/03/2024	Date: 06/03/2024	Date: 06/03/2024
License No.: 10932	License No. 32320	License No. 21585
License Expiration: 11/26/2024	License Expiration: 06/09/2026	License Expiration: 05/08/2025

END SECTION 000000

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- Instructions to Bidders for Construction Projects (July 1, 2022) (eMaryland Marketplace Advantage attachment)

- General Conditions for Construction Contracts (July 1, 2022) (eMaryland Marketplace Advantage attachment)

- Bid/Proposal Affadavit (eMaryland Marketplace Advantage attachment)

- Payment of Employee Health Care Expenses Certification (eMaryland Marketplace Advantage attachment)

- Contractors Questionnaire (eMaryland Marketplace Advantage attachment)

- Bid Bond, *if applicable* (eMaryland Marketplace Advantage attachment)

- Minority Business Enterprise Forms Attachment D (February 5, 2021), *if applicable* (eMaryland Marketplace Advantage attachment)

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- List of Prevailing Wage Rates, *if applicable* (eMaryland Marketplace Advantage attachment)

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- Attachment A – Contract (eMaryland Marketplace Advantage attachment)

- Pre-Bid Conference/Site Visit – **Refer to: State Finance and Procurement Article 14-302(a)(7)(v) and COMAR 21.11.03.09.C.(2)(e).**

END OF SECTION

SECTION 000115
LIST OF DRAWING SHEETS

1. DESCRIPTION

a. **THE DRAWINGS LISTED** below accompanying this specification form a part of the contract.

Drawing No.		Discipline		Title
CS				TITLE SHEET: VICINITY MAP, LOCATION MAP, DRAWING LIST, APPROVALS, CERTIFICATIONS, PROJECT DIRECTORY
		ARCHITECTURE		
A-1				Demolition Floor & Reflected Ceiling Plans
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A-3				Finish Plan, Schedules & Details
A-4				Interior Elevations and ADA Information
A-5				Door Information, Misc Details, ADA Signage & Key Plan / Site Plan
		MECHANICAL		
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E-4				Symbols List, General Notes & Light Fixture Schedule

END OF SECTION

SECTION 000500
PROJECT DIRECTORY

1. ARCHITECTS AND ENGINEERS

a. Architect: Rich Root, AIA

1) Company: Morris & Ritchie Associates, Inc.
2) Address: 1414 Key Highway, Suite M301, Baltimore, Maryland 21230
3) Telephone Number: (443) 490-7120
4) Email: rroot@mragta.com

b. Electrical Engineer: Timothy Smidt, PE
1) Company: Telegent Engineering, Inc.
2) Address: 2216 Commerce Road, Suite 1, Forest Hill, Maryland 21050
3) Telephone Number: (410) 692-5816
4) Email: tsmidt@tel-eng.com

c. Mechanical Engineer: Daniel Fuhrman, PE
1) Company: Telegent Engineering, Inc.
2) Address: 2216 Commerce Road, Suite 1, Forest Hill, Maryland 21050
3) Telephone Number: (410) 692-5816
4) Email: dfuhrman@tel-eng.com

2. OWNER REPRESENTATIVES

a. Project Manager: KariLynn Dunmeyer

1) Company: State of Maryland, Department of General Services.
2) Address: 301 West Preston Street, Suite 1405, Baltimore, Maryland 21201
3) Telephone Number: (410) 767-5842
4) Email: Kari.Dunmeyer@Maryland.Gov

b. Using Agency Representative: Joseph Kangas

1) Company: Joseph Kangas
2) Address: PO Box 39, St. Mary's City, Maryland 20686
3) Telephone Number: (240) 895-4964
4) Email: Joseph.Kangas@Maryland.Gov

END OF SECTION

SECTION 011000
SUMMARY

PART 1 GENERAL

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.

2. SUMMARY

a. Section Includes:

1) Project information.
2) Work covered by Contract Documents.
3) Work by Owner.
4) Access to site.
5) Coordination with occupants.
6) Work restrictions.
7) Miscellaneous provisions.

b. Related Requirements:

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

3. PROJECT INFORMATION

a. Project Identification: Renovations to Farthings Bathroom

b. DGS Project Number SM-850-230-002

1) Project Location: 47414 Old State House Road, Mary's City, Maryland 20686

c. Owner: Maryland Department of General Services.

1) Owner's Representative: KariLynn Dunmeyer

d. Architect: Morris & Ritchie Associates, Inc.

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

a. MEP Engineering: Telegent Engineering, Inc.

5. WORK COVERED BY CONTRACT DOCUMENTS

a. The Work of Project is defined by the Contract Documents and consists of the following:

1) The project consists of the complete interior demolition and renovation of two (2) multi-

occupant restroom facilities to meet ADA compliance requirements. Interior scope of work includes new floor, wall, and ceiling finishes; new mechanical, electrical, and plumbing equipment, and new restroom accessories. Exterior scope of work consists of new exterior landing at entrance into each restroom and new exterior light fixtures.

b. Type of Contract:

1) Project will be constructed under a single prime contract, in accordance with the Owner's Bidding and Contracting Documents.

6. 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) State may perform work as it deems necessary.

7. ACCESS TO SITE

a. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

b. 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 areas determined by the Owner and User during the Bid process.
2) Driveways, Walkways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or 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.

8. COORDINATION WITH OCCUPANTS

a. Full Owner Occupancy: Owner will occupy site and existing building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

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

2) Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

b. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

9. 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.

b. On-Site Work Hours: Limit work in the existing building to normal business working hours of 6:00 a.m. to 6:00 p.m., Monday through Friday, unless otherwise indicated.

1) Weekend Hours: There shall be no work on the weekends, without prior approval from Using Agency.
2) Early Morning Hours: Quiet hours shall be maintained until 6:00 a.m. (no heavy machinery).
3) Hours for Utility Shutdowns: Contractor shall coordinate all utility shutdown times with the Owner and Using Agency.

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 five days in advance of proposed utility interruptions.
2) Obtain Owner's written permission before proceeding with utility interruptions.

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

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

e. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes.

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

g. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

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

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

10. MISCELLANEOUS PROVISIONS (Not Used)

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

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.

2. SUMMARY

a. Section includes administrative and procedural requirements for substitutions.

b. Related Requirements:

1) Section 016000 "Product Requirements/Design Intent" for requirements for submitting comparable product submittals for products by listed manufacturers.

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.

4. ACTION SUBMITTALS

a. Substitution Requests: Submittals for substitutions are after award only. Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1) Substitution Request Form: Use CSI Form 13.1A.
2) Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a) Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.

b) Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.

c) Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

d) Product Data, including drawings and descriptions of products and fabrication and installation procedures.

e) Samples, where applicable or requested.

f) Certificates and qualification data, where applicable or requested.

g) Material test reports from a qualified testing agency indicating and interpreting test

results for compliance with requirements indicated.

h) Cost information, including a proposal of change, if any, in the Contract Sum.

i) 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.

j) 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.

a) Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

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

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.

6. PROCEDURES

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

PART 2 PRODUCTS

1. SUBSTITUTIONS

a. Substitutions for Cause: Submittals for substitutions are after award only. 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. Substitutions for Convenience: Not allowed unless otherwise indicated.

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 012600
CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

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.

2. SUMMARY

a. Section includes administrative and procedural requirements for handling and processing Contract modifications.

b. Related Sections:

1) Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

3. MINOR CHANGES IN THE WORK

a. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

4. PROPOSAL REQUESTS

a. Owner-Initiated Proposal Requests: Owner will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1) Proposal Requests issued by Owner are not instructions either to stop work in progress or to execute the proposed change.
2) Within 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

a) Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

b) Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c) Include costs of labor and supervision directly attributable to the change.
d) Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
e) Quotation Form: Use forms acceptable to Owner.

b. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Owner.

1) Include a statement outlining reasons for the change and the effect of the change on the

Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2) Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3) Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4) Include costs of labor and supervision directly attributable to the change.
5) Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6) Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7) Proposal Request Form: Use form acceptable to Owner.

5. ADMINISTRATIVE CHANGE ORDERS

a. Allowance Adjustment: Refer to Division 01 Section "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

b. Unit Price Adjustment: Refer to Division 01 Section "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit price work.

6. CHANGE ORDER PROCEDURES

a. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

7. CONSTRUCTION CHANGE DIRECTIVE

a. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1) Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

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

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

PART 2 PRODUCTS (Not Used) PART 3

EXECUTION (Not Used)

END OF SECTION

SECTION 012900

PAYMENT PROCEDURES

PART 1 GENERAL

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.

2. SUMMARY

a. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

b. Related Sections:
   1) Division 01 Section "Unit Prices" for administrative requirements governing the use of unit prices.
   2) Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   3) Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
   4) Division 01 Section "Submittal Procedures" for administrative requirements governing the preparation and submittal of the submittal schedule.

3. DEFINITIONS

a. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

4. SCHEDULE OF VALUES

a. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

   1) Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:

      a) Application for Payment forms with continuation sheets.
      b) Submittal schedule.
      c) Items required to be indicated as separate activities in Contractor's construction schedule.

   2) Submit the schedule of values to Owner at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
   3) Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
   4) Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values correlated with each element.

b. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1) Identification: Include the following Project identification on the schedule of values:

a) Project name and location.
b) Name of Architect.
c) Architect's project number.
d) Contractor's name and address.
e) Date of submittal.

2) Arrange schedule of values consistent with format of AIA Document G703 or form required by DGS Inspection.

3) Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.

a) Include separate line items under principal subcontracts for project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

4) Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5) Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

a) Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

6) Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7) Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
8) Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

a) Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

9) Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

5. APPLICATIONS FOR PAYMENT

a. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1) Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

b. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

c. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment, or forms required by DGS Inspection.

d. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1) Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2) Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3) Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4) Indicate separate amounts for work being carried out under Owner-requested project acceleration.

e. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1) Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2) Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3) Provide summary documentation for stored materials indicating the following:

a) Materials previously stored and included in previous Applications for Payment.
b) Work completed for this Application utilizing previously stored materials.
c) Additional materials stored with this Application.
d) Total materials remaining stored, including materials with this Application.

f. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1) Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

g. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1) Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2) When an application shows completion of an item, submit conditional final or full waivers.
3) Owner reserves the right to designate which entities involved in the Work must submit

waivers.

4) Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5) Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

h. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1) List of subcontractors.
2) Schedule of values.
3) Contractor's construction schedule (preliminary if not final).
4) Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5) Products list (preliminary if not final).
6) Schedule of unit prices.
7) Submittal schedule (preliminary if not final).
8) List of Contractor's staff assignments.
9) List of Contractor's principal consultants.
10) Copies of building permits.
11) Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
12) Initial progress report.
13) Report of preconstruction conference.
14) Certificates of insurance and insurance policies.
15) Performance and payment bonds.
16) Data needed to acquire Owner's insurance.

i. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1) Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2) This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

j. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1) Evidence of completion of Project closeout requirements.
2) Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3) Updated final statement, accounting for final changes to the Contract Sum.
4) AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5) AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6) AIA Document G707, "Consent of Surety to Final Payment."
7) Evidence that claims have been settled.
8) Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

9) Final liquidated damages settlement statement.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 013100
PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

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.

2. SUMMARY

a. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1) General project coordination procedures.
2) Administrative and supervisory personnel.
3) Coordination drawings.
4) Requests for Information (RFIs).
5) Project meetings.

b. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

c. Related Sections:
1) Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2) Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3) Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

3. DEFINITIONS

a. RFI: Request from Owner, Architect, or Contractor seeking information from each other during construction.

4. COORDINATION

a. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1) Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2) Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
3) Make adequate provisions to accommodate items scheduled for later installation.

b. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1) Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

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

1) Preparation of Contractor's construction schedule.
2) Preparation of the schedule of values.
3) Installation and removal of temporary facilities and controls.
4) Delivery and processing of submittals.
5) Progress meetings.
6) Preinstallation conferences.
7) Project closeout activities.
8) Startup and adjustment of systems.
9) Project closeout activities.

d. Conservation: Coordinate construction activities to ensure that operations are carried out 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. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

5. COORDINATION DRAWINGS

a. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1) Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a) Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b) Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c) Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d) Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e) Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f) Indicate required installation sequences.
g) Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will

not be considered changes to the Contract.

b. Coordination Drawing Organization: Organize coordination drawings as follows:

1) Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2) Plenum Space: Indicate sub framing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3) Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.
4) Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5) Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6) Mechanical and Plumbing Work: Show the following:

a) Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
b) Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
c) Fire-rated enclosures around ductwork.

7) Electrical Work: Show the following:

a) Runs of vertical and horizontal conduit 1-1/4 inch diameter and larger.
b) Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations.
c) Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
d) Location of pull boxes and junction boxes, dimensioned from column center lines.

8) Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the Architect determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Architect will so inform the Contractor, who shall make changes as directed and resubmit.
9) Coordination Drawing Prints: Prepare coordination drawing prints in accordance with requirements of Division 01 Section "Submittal Procedures."

6. KEY PERSONNEL

a. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1) Post copies of list in project meeting room, in temporary field office, and by each

temporary telephone. Keep list current at all times.

7. REQUESTS FOR INFORMATION (RFIs)

a. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1) Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2) Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

b. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1) Project name.
2) Project number.
3) Date.
4) Name of Contractor.
5) Name of Architect.
6) RFI number, numbered sequentially.
7) RFI subject.
8) Specification Section number and title and related paragraphs, as appropriate.
9) Drawing number and detail references, as appropriate.
10) Field dimensions and conditions, as appropriate.
11) Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12) Contractor's signature.
13) Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

a) Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

c. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

d. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1) The following RFIs will be returned without action:

a) Requests for approval of submittals.
b) Requests for approval of substitutions.
c) Requests for coordination information already indicated in the Contract Documents.
d) Requests for adjustments in the Contract Time or the Contract Sum.
e) Requests for interpretation of Architect's actions on submittals.
f) Incomplete RFIs or inaccurately prepared RFIs.

2) Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.

3) Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

a) If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

e. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

f. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:

1) Project name.
2) Name and address of Contractor.
3) Name and address of Architect.
4) RFI number including RFIs that were dropped and not submitted.
5) RFI description.
6) Date the RFI was submitted.
7) Date Architect's response was received.
8) Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9) Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

8. PROJECT MEETINGS

a. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1) Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2) Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3) Minutes: Architect will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Contractor, within three days of the meeting.

b. Preconstruction Conference: Owner will schedule a preconstruction conference before starting construction, at a time convenient to Contractor and Architect, but no later than 15 days after execution of the Agreement.

1) Attendees: Authorized representatives of Owner, Architect and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2) Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

c. Progress Meetings: Conduct progress meetings at bi-weekly intervals.

1) Coordinate dates of meetings with preparation of payment requests.
2) Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in

planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

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

   a) Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

      1) Review schedule for next period.

   b) Review present and future needs of each entity present, including the following:

      1) Interface requirements.
      2) Sequence of operations.
      3) Status of submittals.
      4) Deliveries.
      5) Off-site fabrication.
      6) Access.
      7) Site utilization.
      8) Temporary facilities and controls.
      9) Progress cleaning.
      10) Quality and work standards.
      11) Status of correction of deficient items.
      12) Field observations.
      13) Status of RFIs.
      14) Status of proposal requests.
      15) Pending changes.
      16) Status of Change Orders.
      17) Pending claims and disputes.
      18) Documentation of information for payment requests.

4) Minutes: Architect will record and distribute the meeting minutes to each party present and to parties requiring information.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 013200

CONSTRUCTION PROGRESS DOCUMENTATION

1. This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.
2. Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

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:

B. Revise list below to suit Project.

1. Start-up construction schedule.
2. Contractor's construction schedule.
3. Daily construction reports.
4. Material location reports.
5. Field condition reports.
6. Special reports.

C. Related Sections:

1. Retain Sections in subparagraphs below that contain requirements Contractor might expect to find in this Section but are specified in other Sections.
2. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
3. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Retain definition(s) remaining after this Section has been edited.

B. 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.

PART 2 Definitions in six paragraphs below are associated with network critical path method (CPM) type schedule. Delete definitions if using only bar (Gantt) type schedule.

A. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of the Project.

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

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

PART 3 Retain definition in first paragraph below for most projects utilizing CPM-type schedule. Designating ownership of float can save arguments later. See Evaluations.

A. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

B. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

PART 2 Retain one of two subparagraphs below

1. PDF electronic file.

B. Start-up construction schedule.

PART 3 Retain subparagraph below if requiring schedule of values and Applications for Payment submittals utilizing network cost- and resource-loaded reporting as part of requirements in Division 01 Section "Payment Procedures."

1. Approval of cost-loaded start-up construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Start-up 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.

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 all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

A. Daily Construction Reports: Submit at monthly intervals.

B. Material Location Reports: Submit at monthly intervals.

C. Field Condition Reports: Submit at time of discovery of differing conditions.

D. Special Reports: Submit at time of unusual event.

E. 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 Division 01 Section "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:

PART 2 Revise list below to suit Project.

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, interim milestones and partial Owner occupancy.
4. Review time required for review of submittals and resubmittals.
5. Review requirements for tests and inspections by independent testing and inspecting agencies.
6. Review time required for completion and startup procedures.
7. Review and finalize list of construction activities to be included in schedule.
8. Review submittal requirements and procedures.
9. Review procedures for updating schedule.

1.6 COORDINATION

PART 1 Coordinate requirements in this article with submittal schedule requirements in Division 01 Section "Submittal Procedures".

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts**,** 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.

PART 2 PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL (See General Conditions Section 5.05 (July 2022))

A. 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.

B. Activities: Treat separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

PART 3 Revise first subparagraph below to suit Project. Long activity durations provide less detail and, therefore, less information with which to manage a project. As an alternative to specifying activity duration, indicate minimum and maximum number of activities, which will result in a similar effect.

1. Activity Duration: Define activities so no activity is longer than 15 calendar 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 calendar 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 Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.

4. Startup and Testing Time: Include not less than 15 calendar days for startup and testing.

5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

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

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.

PART 4 Retain first six subparagraphs below if applicable.

1. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.

2. Work Restrictions: Show the effect of the following items on the schedule:

PART 5 Revise list below to suit Project.

a. Coordination with existing construction.

b. Limitations of continued occupancies.

c. Uninterruptible services.

d. Partial occupancy before Substantial Completion.

e. Use of premises restrictions.

f. Seasonal variations.

g. Environmental control.

1. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

PART 2 Revise list below to suit Project.

a. Subcontract awards.

b. Submittals.

c. Purchases.

d. Mockups.

e. Fabrication.

f. Sample testing.

g. Deliveries.

h. Installation.

i. Tests and inspections.

j. Adjusting.

k. Curing.

l. Startup and placement into final use and operation.

2. 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:

PART 3 Revise list below to suit Project.

a. Structural completion.

b. Permanent space enclosure.

c. Completion of mechanical installation.

d. Completion of electrical installation.

e. Substantial Completion.

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

E. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

1. Refer to Division 01 Section "Payment Procedures" for cost reporting and payment procedures.

F. 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 RFIs.

3. Rejected or unreturned submittals.

4. Notations on returned submittals.

G. 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, and equipment required to achieve compliance, and date by which recovery will be accomplished.

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

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

PART 3 Gantt-chart schedule in this article is adequate for many projects. Delete this article if Project size and complexity justify CPM construction schedule.

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's construction schedule within 30 calendar days of date established for the Notice to Proceed. Base schedule on the start-up 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.

2.3 REPORTS

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

PART 3 Revise list below to suit Project.

1. List of subcontractors at Project site.
2. Approximate count of personnel at Project site.
3. Equipment at Project site.
4. Material deliveries.
5. High and low temperatures and general weather conditions, including presence of rain or snow.
6. Accidents.
7. Meetings and significant decisions.
8. Unusual events (refer to special reports).
9. Stoppages, delays, shortages, and losses.
10. Meter readings and similar recordings.
11. Emergency procedures.
12. Orders and requests of authorities having jurisdiction.
13. Change Orders received and implemented.
14. Construction Change Directives received and implemented.
15. Services connected and disconnected.
16. Equipment or system tests and startups.
17. Partial completions and occupancies.
18. 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.

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

2.4 SPECIAL REPORTS

PART 3 Delete this article on projects with only minimal requirements.

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of

results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

PART 4 Retain first paragraph below only for very complex projects of long duration.

PART 5 Delete first subparagraph below if not allowed or if Owner wants to retain an independent consultant. See Evaluations.

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

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

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

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

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

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

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

END OF SECTION

SECTION 013300

SUBMITTAL PROCEDURES

PART 1 GENERAL

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. (See General Conditions Section 5.05 (July 2022))

2. SUMMARY

a. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

b. Related Sections:

1) Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2) Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3) Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
4) Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
5) Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

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.

c. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

d. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

4. ACTION SUBMITTALS

a. Submittal Schedule: Submit a schedule 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 modifications to submittals noted by the 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 start-up 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 dates for installation.
    i) Activity or event number.

5. SUBMITTAL ADMINISTRATIVE REQUIREMENTS

a. 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 different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a) Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

b. 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 calendar 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 calendar 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 calendar 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 calendar days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

c. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.

1) Indicate name of firm or entity that prepared each submittal on label or title block.

2) Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.

3) Include the following information for processing and recording action taken:

a) Project name.
b) Date.
c) Name of Architect.
d) Name of Contractor.
e) Name of subcontractor.
f) Name of supplier.
g) Name of manufacturer.
h) Submittal number or other unique identifier, including revision identifier.

1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A). Contractor and Architect shall use the same submittal numbering system to avoid confusion.

i) Number and title of appropriate Specification Section.
j) Drawing number and detail references, as appropriate.
k) Location(s) where product is to be installed, as appropriate.
l) Other necessary identification.

d. Options: Identify options requiring selection by the Architect.

e. Deviations: Identify deviations from the Contract Documents on submittals.

f. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

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

g. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.

1) Transmittal Form: Provide locations on form for the following information:

a) Project name.
b) Date.
c) Destination (To:).
d) Source (From:).
e) Names of subcontractor, manufacturer, and supplier.
f) Category and type of submittal.
g) Submittal purpose and description.
h) Specification Section number and title.
i) Indication of full or partial submittal.
j) Drawing number and detail references, as appropriate.
k) Transmittal number, numbered consecutively.
l) Submittal and transmittal distribution record.
m) Remarks.
n) Signature of transmitter.

2) On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

h. 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.

i. 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.

j. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

PART 2 PRODUCTS

1. SUBMITTAL PROCEDURES

a. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1) Action Submittals: Submit three paper copies of each submittal, unless otherwise indicated. Architect will return two copies.
2) Informational Submittals: Submit two paper copies of each submittal, unless otherwise indicated. Architect will not return copies.
3) Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
4) Certificates and Certifications Submittals: Provide 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.

a) Provide a notarized statement on original paper copy certificates and certifications where indicated.

5) Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

b. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1) If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.

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

3) Include the following information, as applicable:

a) Manufacturer's 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 showing 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 or concurrent with Samples.

6) Submit Product Data in the following format:

a) Portable Document Format (PDF)

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

1) Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a) 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.

2) Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by

42 inches (750 by 1067 mm)

3) Submit Shop Drawings in the following format:

a) Portable Document Format (PDF)

d. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1) Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2) Identification: Attach label on unexposed side of Samples that includes the following:

a) Generic description of Sample.
b) Product name and name of manufacturer.
c) Sample source.
d) Number and title of applicable Specification Section.

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

a) Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b) Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

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

a) Number of Samples: Submit 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.

5) Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

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.

e. 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.
2) Manufacturer and product name, and model number if applicable.
3) Number and name of room or space.
4) Location within room or space.
5) Submit product schedule in the following format:

    a) Portable Document Format (PDF)

f. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

g. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

h. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

i. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1) Name, address, and telephone number of entity performing subcontract or supplying products.
2) Number and title of related Specification Section(s) covered by subcontract.
3) Drawing number and detail references, as appropriate, covered by subcontract.
4) Submit subcontract list in the following format:

    a) Portable Document Format (PDF)

j. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

k. 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.

l. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

m. 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.

n. 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.

o. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

p. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

q. 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.

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

s. 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:

1) Name of evaluation organization.
2) Date of evaluation.
3) Time period when report is in effect.
4) Product and manufacturers' names.
5) Description of product.
6) Test procedures and results.
7) Limitations of use.

t. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

u. 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.

v. 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.

w. Field Test Reports: Submit 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.

x. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

y. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2. DELEGATED-DESIGN SERVICES

a. Performance and Design Criteria: Where professional design services or certifications by a

design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

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

b. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

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

PART 3 EXECUTION

1. CONTRACTOR'S REVIEW

a. Action 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. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "Closeout Procedures."

c. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

2. ARCHITECT'S ACTION

a. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

b. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

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

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

e. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

f. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION

SECTION 014000

QUALITY REQUIREMENTS

PART 1 GENERAL

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.

2. SUMMARY

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

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

1) Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2) Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3) Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

c. Related Sections:

1) Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
2) Divisions 02 through 49 Sections, where applicable, for specific test and inspection requirements.

3. DEFINITIONS

a. 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.

b. 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. Services do not include contract enforcement activities performed by Architect.

c. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
1) Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from

the building but on the project site, consisting of multiple products, assemblies and subassemblies.

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

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

e. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

f. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

g. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

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

i. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1) Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.

j. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

4. CONFLICTING REQUIREMENTS

a. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

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

5. REPORTS AND DOCUMENTS

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

1) Date of issue.

2) Project title and number.
3) Name, address, and telephone number of testing agency.
4) Dates and locations of samples and tests or inspections.
5) Names of individuals making tests and inspections.
6) Description of the Work and test and inspection method.
7) Identification of product and Specification Section.
8) Complete test or inspection data.
9) Test and inspection results and an interpretation of test results.
10) Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11) Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12) Name and signature of laboratory inspector.
13) Recommendations on retesting and reinspecting.

b. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

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

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

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

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

6. QUALITY ASSURANCE

a. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

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

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

d. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

e. Professional Engineer Qualifications: A professional engineer who is legally qualified 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 to those indicated for this Project in material, design, and extent.

f. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

    1) Requirements of authorities having jurisdiction shall supersede requirements for specialists.

g. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

    1) NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
    2) NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

h. 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) Pay all testing costs.
        b) Provide test specimens representative of proposed products and contruction.
        c) Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
        d) Provide sizes and configurations of test assemblies and mockups to adequately demonstrate capability of products to comply with performance requirements.
        e) Build site-assembled test assemblies and mockups using installers who will

perform same tasks for Project.

f) When testing is complete, remove test specimens, assemblies, mockups; do not reuse products on Project.

2) Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

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 in location and of size indicated or, if not indicated, as directed by Owner.
2) Notify Owner seven days in advance of dates and times when mockups will be constructed.
3) Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
4) Demonstrate the proposed range of aesthetic effects and workmanship.
5) Obtain Owner's approval of mockups before starting work, fabrication, or construction.

a) Allow seven days for initial review and each re-review of each mockup.

6) Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7) Demolish and remove mockups when directed, unless otherwise indicated.

l. Integrated Exterior Mockups: Construct integrated exterior mockup in accordance with approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual specification sections, along with supporting materials.

m. Room Mockups: Construct room mockups incorporating required materials and assemblies, finished in accordance with requirements. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work.

7. QUALITY CONTROL

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

1) Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2) Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
3) Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4) Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5) Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

6) Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

b. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

c. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in 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.

d. 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.

e. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

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

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

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

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

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

h. 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.

8. SPECIAL TESTS AND INSPECTIONS

a. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1) Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2) Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3) Submitting a certified written report of each test, inspection, and similar quality- control service to Architect with copy to Contractor and to authorities having jurisdiction.
4) Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5) Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6) Retesting and reinspecting corrected work.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

1. TEST AND INSPECTION LOG

a. 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 modifications as they occur. Provide access to test and inspection log for Owner's reference during normal working hours.

2. REPAIR AND PROTECTION

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

1) Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "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

SECTION 014200
REFERENCES

PART 1 GENERAL

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.

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.

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.

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. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1) AABC - Associated Air Balance Council; www.aabc.com.
2) AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3) AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4) AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5) AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6) ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7) ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
8) ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
9) AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
10) AF&PA - American Forest & Paper Association; www.afandpa.org.
11) AGA - American Gas Association; www.aga.org.
12) AHAM - Association of Home Appliance Manufacturers; www.aham.org.
13) AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
14) AI - Asphalt Institute; www.asphaltinstitute.org.
15) AIA - American Institute of Architects (The); www.aia.org.
16) AISC - American Institute of Steel Construction; www.aisc.org.
17) AISI - American Iron and Steel Institute; www.steel.org.
18) AITC - American Institute of Timber Construction; www.aitc-glulam.org.
19) AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
20) ANSI - American National Standards Institute; www.ansi.org.
21) AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
22) APA - APA - The Engineered Wood Association; www.apawood.org.
23) APA - Architectural Precast Association; www.archprecast.org.
24) API - American Petroleum Institute; www.api.org.
25) ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
26) ARI - American Refrigeration Institute; (See AHRI).
27) ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
28) ASCE - American Society of Civil Engineers; www.asce.org.
29) ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
30) ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
31) ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
32) ASSE - American Society of Safety Engineers (The); www.asse.org.

33) ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34) ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
35) ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
36) AWEA - American Wind Energy Association; www.awea.org.
37) AWI - Architectural Woodwork Institute; www.awinet.org.
38) AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
39) AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
40) AWS - American Welding Society; www.aws.org.
41) AWWA - American Water Works Association; www.awwa.org.
42) BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
43) BIA - Brick Industry Association (The); www.gobrick.com.
44) BICSI - BICSI, Inc.; www.bicsi.org.
45) BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
46) BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
47) BOCA - BOCA; (Building Officials and Code Administrators International Inc.); (See ICC).
48) BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwfbadminton.org.
49) CDA - Copper Development Association; www.copper.org.
50) CEA - Canadian Electricity Association; www.electricity.ca.
51) CEA - Consumer Electronics Association; www.ce.org.
52) CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
53) CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
54) CGA - Compressed Gas Association; www.cganet.com.
55) CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
56) CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
57) CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
58) CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
59) CPA - Composite Panel Association; www.pbmdf.com.
60) CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
61) CRRC - Cool Roof Rating Council; www.coolroofs.org.
62) CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
63) CSA - Canadian Standards Association; www.csa.ca.
64) CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
65) CSI - Construction Specifications Institute (The); www.csinet.org.
66) CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67) CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
68) CWC - Composite Wood Council; (See CPA).
69) DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
70) DHI - Door and Hardware Institute; www.dhi.org.
71) ECA - Electronic Components Association; www.ec-central.org.
72) ECAMA - Electronic Components Assemblies & Materials Association; (See ECA).
73) EIA - Electronic Industries Alliance; (See TIA).
74) EIMA - EIFS Industry Members Association; www.eima.com.

75) EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
76) ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
77) ESTA - Entertainment Services and Technology Association; (See PLASA).
78) EVO - Efficiency Valuation Organization; www.evo-world.org.
79) FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
80) FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
81) FM Approvals - FM Approvals LLC; www.fmglobal.com.
82) FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
83) FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
84) FSA - Fluid Sealing Association; www.fluidsealing.com.
85) FSC - Forest Stewardship Council U.S.; www.fscus.org.
86) GA - Gypsum Association; www.gypsum.org.
87) GANA - Glass Association of North America; www.glasswebsite.com.
88) GS - Green Seal; www.greenseal.org.
89) HI - Hydraulic Institute; www.pumps.org.
90) HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
91) HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
92) HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
93) HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
94) IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
95) IAS - International Approval Services; (See CSA).
96) ICBO - International Conference of Building Officials; (See ICC).
97) ICC - International Code Council; www.iccsafe.org.
98) ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
99) ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
100) ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
101) IEC - International Electrotechnical Commission; www.iec.ch.
102) IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
103) IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
104) IESNA - Illuminating Engineering Society of North America; (See IES).
105) IEST - Institute of Environmental Sciences and Technology; www.iest.org.
106) IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
107) IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
108) ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
109) Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
110) ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
111) ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
112) ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
113) ISO - International Organization for Standardization; www.iso.org.
114) ISSFA - International Solid Surface Fabricators Association; (See ISFA).
115) ITU - International Telecommunication Union; www.itu.int/home.
116) KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
117) LMA - Laminating Materials Association; (See CPA).

118) LPI - Lightning Protection Institute; www.lightning.org.
119) MBMA - Metal Building Manufacturers Association; www.mbma.com.
120) MCA - Metal Construction Association; www.metalconstruction.org.
121) MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
122) MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
123) MHIA - Material Handling Industry of America; www.mhia.org.
124) MIA - Marble Institute of America; www.marble-institute.com.
125) MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
126) MPI - Master Painters Institute; www.paintinfo.com.
127) MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
128) NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
129) NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
130) NADCA - National Air Duct Cleaners Association; www.nadca.com.
131) NAIMA - North American Insulation Manufacturers Association; www.naima.org.
132) NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
133) NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
134) NCMA - National Concrete Masonry Association; www.ncma.org.
135) NEBB - National Environmental Balancing Bureau; www.nebb.org.
136) NECA - National Electrical Contractors Association; www.necanet.org.
137) NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
138) NEMA - National Electrical Manufacturers Association; www.nema.org.
139) NETA - InterNational Electrical Testing Association; www.netaworld.org.
140) NFHS - National Federation of State High School Associations; www.nfhs.org.
141) NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
142) NFPA - NFPA International; (See NFPA).
143) NFRC - National Fenestration Rating Council; www.nfrc.org.
144) NHLA - National Hardwood Lumber Association; www.nhla.com.
145) NLGA - National Lumber Grades Authority; www.nlga.org.
146) NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
147) NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
148) NRCA - National Roofing Contractors Association; www.nrca.net.
149) NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
150) NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
151) NSPE - National Society of Professional Engineers; www.nspe.org.
152) NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
153) NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
154) NWFA - National Wood Flooring Association; www.nwfa.org.
155) PCI - Precast/Prestressed Concrete Institute; www.pci.org.
156) PDI - Plumbing & Drainage Institute; www.pdionline.org.
157) PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
158) RCSC - Research Council on Structural Connections; www.boltcouncil.org.
159) RFCI - Resilient Floor Covering Institute; www.rfci.com.
160) RIS - Redwood Inspection Service; www.redwoodinspection.com.
161) SAE - SAE International; (Society of Automotive Engineers); www.sae.org.

162) SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
163) SDI - Steel Deck Institute; www.sdi.org.
164) SDI - Steel Door Institute; www.steeldoor.org.
165) SEFA - Scientific Equipment and Furniture Association; www.sefalabs.com.
166) SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
167) SIA - Security Industry Association; www.siaonline.org.
168) SJI - Steel Joist Institute; www.steeljoist.org.
169) SMA - Screen Manufacturers Association; www.smainfo.org.
170) SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
171) SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
172) SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
173) SPIB - Southern Pine Inspection Bureau; www.spib.org.
174) SPRI - Single Ply Roofing Industry; www.spri.org.
175) SRCC - Solar Rating and Certification Corporation; www.solar-rating.org.
176) SSINA - Specialty Steel Industry of North America; www.ssina.com.
177) SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
178) STI - Steel Tank Institute; www.steeltank.com.
179) SWI - Steel Window Institute; www.steelwindows.com.
180) SWPA - Submersible Wastewater Pump Association; www.swpa.org.
181) TCA - Tilt-Up Concrete Association; www.tilt-up.org.
182) TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); www.tileusa.com.
183) TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
184) TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
185) TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
186) TMS - The Masonry Society; www.masonrysociety.org.
187) TPI - Truss Plate Institute; www.tpinst.org.
188) TPI - Turfgrass Producers International; www.turfgrasssod.org.
189) TRI - Tile Roofing Institute; www.tileroofing.org.
190) UBC - Uniform Building Code; (See ICC).
191) UL - Underwriters Laboratories Inc.; www.ul.com.
192) UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
193) USAV - USA Volleyball; www.usavolleyball.org.
194) USGBC - U.S. Green Building Council; www.usgbc.org.
195) USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
196) WASTEC - Waste Equipment Technology Association; www.wastec.org.
197) WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
198) WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
199) WDMA - Window & Door Manufacturers Association; www.wdma.com.
200) WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
201) WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
202) WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
203) WPA - 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) IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
2) ICC - International Code Council; www.iccsafe.org.
3) ICC-ES - ICC Evaluation Service, LLC; www.icc-es.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.

1) COE - Army Corps of Engineers; www.usace.army.mil.
2) CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3) DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4) DOD - Department of Defense; http://dodssp.daps.dla.mil.
5) DOE - Department of Energy; www.energy.gov.
6) EPA - Environmental Protection Agency; www.epa.gov.
7) FAA - Federal Aviation Administration; www.faa.gov.
8) FG - Federal Government Publications; www.gpo.gov.
9) GSA - General Services Administration; www.gsa.gov.
10) HUD - Department of Housing and Urban Development; www.hud.gov.
11) LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; http://eetd.lbl.gov.
12) OSHA - Occupational Safety & Health Administration; www.osha.gov.
13) SD - Department of State; www.state.gov.
14) TRB - Transportation Research Board; National Cooperative Highway Research Program; www.trb.org.
15) USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16) USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17) USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18) USP - U.S. Pharmacopeia; www.usp.org.
19) USPS - United States Postal Service; www.usps.com.

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.

1) CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2) DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
3) DSCC - Defense Supply Center Columbus; (See FS).
4) FED-STD - Federal Standard; (See FS).
5) FS - Federal Specification; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.

a) Available from Defense Standardization Program; www.dsp.dla.mil.
b) Available from General Services Administration; www.gsa.gov.
c) Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.

6) MILSPEC - Military Specification and Standards; (See DOD).
7) USAB - United States Access Board; 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) COMAR – CODE of Maryland Regulations.

PART 2 PRODUCTS (Not Used) PART 3

EXECUTION (Not Used)

END OF SECTION

SECTION 015000

TEMP FACILITIES AND CONTROL

PART 1 GENERAL

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.

2. SUMMARY

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

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 to use temporary services and facilities without cost, including, but not limited to, Owner, Architect, Occupants of Project, testing agencies, and authorities having jurisdiction.

b. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations. Provide connections and extensions of services as required for construction operations.

c. Water Service: Pay water-service use charges for water used by all entities for construction operations. Provide connections and extensions of services as required for construction operations.

d. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations. Provide connections and extensions of services as required for construction operations.

4. INFORMATIONAL SUBMITTALS

a. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

b. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

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

5. QUALITY ASSURANCE

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

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

c. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural &

Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

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

1. MATERIALS

a. Portable Chain-Link Fencing

2. TEMPORARY FACILITIES

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

b. Common-Use Field Office: Of sufficient size to accommodate needs of Construction Manager and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly.

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.

3. EQUIPMENT

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

PART 3 EXECUTION

1. INSTALLATION, GENERAL

a. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

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.

2. 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. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1) Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

c. 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.

d. 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.

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.
2) Install lighting for Project identification sign.

3. 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 E 136. 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. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1) Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2) Prepare subgrade and install subbase and base for temporary roads and paved areas according to Civil Drawings and Notes."
3) Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.

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

d. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1) Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2) Remove snow and ice as required to minimize accumulations.

4. 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.

b. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Civil Drawings and Notes.

c. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1) Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2) Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

5. OPERATION, TERMINATION, AND REMOVAL

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

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

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

c. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.

d. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

e. 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

SECTION 016000

PRODUCT REQUIREMENTS

PART 1 GENERAL

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.

2. SUMMARY

a. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

b. Related Requirements:

1) Section 012100 "Allowances" for products selected under an allowance.
2) Section 012500 "Substitution Procedures" for requests for substitutions.
3) Section 014200 "References" for applicable industry standards for products specified.
4) Section 013300 "Submittal Requirements" for product data requirements.

3. DEFINITIONS

a. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1) Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2) New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3) Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

b. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

4. ACTION SUBMITTALS

a. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1) Include data to indicate compliance with the requirements specified in "Comparable

Products" Article.

2) Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a) Form of Approval: As specified in Section 013300 "Submittal Procedures."
b) Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

b. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

5. QUALITY ASSURANCE

a. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

6. PRODUCT DELIVERY, STORAGE, AND HANDLING

a. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

b. Delivery and Handling:

1) Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2) Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
3) Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

c. Storage:

1) Store products to allow for inspection and measurement of quantity or counting of units.
2) Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

7. PRODUCT WARRANTIES

a. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1) Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2) Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

b. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1) Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2) See other Sections for specific content requirements and particular requirements for submitting special warranties.

c. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures." PART 2

PRODUCTS

1. PRODUCT SELECTION PROCEDURES

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

1) Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2) Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3) Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4) Where products are accompanied by the term "as selected," Architect will make selection.
5) Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6) Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

b. Product Selection Procedures:

1) Products:

a) Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

2. COMPARABLE PRODUCTS

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

1) Evidence that the proposed product does not require revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2) Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

3) Evidence that proposed product provides specified warranty.
4) List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5) Samples, if requested.

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 017300
EXECUTION

PART 1 GENERAL

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.

2. SUMMARY

a. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1) Construction layout.
2) Field engineering and surveying.
3) Installation of the Work.
4) Cutting and patching.
5) Progress cleaning.
6) Starting and adjusting.
7) Protection of installed construction.
8) Correction of the Work.

b. Related Sections:

1) Division 01 Section "Submittal Procedures" for submitting surveys.
2) Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

3. DEFINITIONS

a. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

b. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

4. INFORMATIONAL SUBMITTALS

a. Qualification Data: For land surveyor.

b. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

c. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1) Extent: Describe reason for and extent of each occurrence of cutting and patching.
2) Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.

3) Products: List products to be used for patching and firms or entities that will perform patching work.
4) Dates: Indicate when cutting and patching will be performed.
5) Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate how long services and systems will be disrupted.

d. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

e. Certified Surveys: Submit electronic PDF portable document format file, signed by land surveyor.

f. Final Property Survey: Submit electronic PDF portable document format file, showing the Work performed and record survey data.

5. QUALITY ASSURANCE

a. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land- surveying services of the kind indicated.

b. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1) Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection

2) Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

a) Primary operational systems and equipment.
b) Air or smoke barriers.
c) Mechanical systems piping and ducts.
d) Control systems.
e) Communication systems.
f) Electrical wiring systems.

3) Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

a) Water, moisture, or vapor barriers.
b) Membranes and flashings.
c) Equipment supports.

d) Piping, ductwork, vessels, and equipment.
e) Noise- and vibration-control elements and systems.

4) Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

c. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

d. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

6. WARRANTY

a. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

b. Except to the extent that the contract documents impose longer warranty obligations on the Contractor for all or any part of the work, the Contractor warrants for a two-year period commencing on the date of substantial completion of the project as a whole or on such other date agreed between the parties:
1) That the work contains no fault or imperfect material or equipment or any imperfect, careless, or unskilled workmanship.
2) 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.
3) Found not to be as guaranteed by this section or otherwise not in conformity with the contract and that it will make good all damages caused to other work or materials in the process of complying with this section.
4) That the entire work shall be watertight and leak-proof in every particular.

c. This Section provides for a period during which the Contractor is bound to replace work in addition to be liable for failure to perform the contract in accordance with its terms. Nothing herein releases or limits the Contractor's liability for latent defects or for any substantial failure to perform the work in accordance with the contract, even if such defects or failure are discovered after the expiration of the warranty period provided by this section.

PART 2 PRODUCTS

1. MATERIALS

a. General: Comply with requirements specified in other Sections.

b. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1) If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 EXECUTION

1. EXAMINATION

a. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1) Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2) Furnish location data for work related to Project that must be performed by public utilities serving Project site.

b. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1) Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

a) Description of the Work.
b) List of detrimental conditions, including substrates.
c) List of unacceptable installation tolerances.
d) Recommended corrections.

2) Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3) Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4) Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5) Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

2. PREPARATION

a. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

b. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

c. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

d. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

3. CONSTRUCTION LAYOUT

a. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

b. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1) Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2) Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3) Inform installers of lines and levels to which they must comply.
4) Check the location, level and plumb, of every major element as the Work progresses.
5) Notify Architect when deviations from required lines and levels exceed allowable tolerances.
6) Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

c. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

d. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

e. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

4. FIELD ENGINEERING

a. Identification: Owner will identify existing benchmarks, control points, and property corners.

b. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1) Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2) Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

c. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1) Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2) Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3) Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

d. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site work.

e. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

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

5. INSTALLATION

a. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1) Make vertical work plumb and make horizontal work level.
2) Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3) Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4) Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.

b. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

c. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

d. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

e. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

f. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

g. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1) Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2) Allow for building movement, including thermal expansion and contraction.
3) Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

h. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

i. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

6. PROGRESS CLEANING

a. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1) Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2) Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3) Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

a) Utilize containers intended for holding waste materials of type to be stored.

4) Coordinate progress cleaning for joint-use areas where more than one installer has worked.

b. Site: Maintain Project site free of waste materials and debris.

c. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1) Remove liquid spills promptly.
2) Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

d. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

e. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

f. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

g. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."

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

i. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

j. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

7. STARTING AND ADJUSTING

a. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

b. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

c. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

d. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

8. PROTECTION OF INSTALLED CONSTRUCTION

a. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

b. Comply with manufacturer's written instructions for temperature and relative humidity.

9. CORRECTION OF THE WORK

a. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1) Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

b. Restore permanent facilities used during construction to their specified condition.

c. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

d. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

e. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 017700

CLOSEOUT PROCEDURES

PART 1 GENERAL

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.

2. SUMMARY

a. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1) Substantial Completion procedures.
2) Final completion procedures.
3) Warranties.
4) Final cleaning.

b. Related Sections:

1) Division 01 Section "Execution" for progress cleaning of Project site.
2) Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3) Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
4) Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
5) Divisions 02 through 49 Sections, where applicable, for specific closeout and special cleaning requirements for the Work in those Sections.

3. SUBSTANTIAL COMPLETION

a. Contractor Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, the Contractor shall complete the following. List items below that are incomplete with request.

1) Prepare a list of items to be completed and corrected (Contractor work list), the value of items on the list, and reasons why the Work is not complete.
2) Advise Owner of pending insurance changeover requirements.
3) Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4) Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5) Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
6) Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7) Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8) Complete startup testing of systems.
9) Submit test/adjust/balance records.

10) Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11) Advise Owner of changeover in heat and other utilities.
12) Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13) Complete final cleaning requirements, including touchup painting.
14) Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

b. When complete, the Contractor shall submit a written request for inspection for Substantial Completion as required by Section 7.12 of the General Conditions.

1) Section 7.12 of the General Conditions will be followed in establishing the Substantial Completion Date

4. FINAL COMPLETION

a. Contractor Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1) Submit a final Application for Payment according to Division 01 Section "Payment Procedures" and General Conditions "Final Payment" Section 8.08 (July 2022).
2) Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3) Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4) Submit pest-control final inspection report and warranty.
5) Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

b. Inspection, if required, the Contractor shall submit a written request for final inspection for acceptance. 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) Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

5. LIST OF INCOMPLETE ITEMS (PUNCH LIST), See General Conditions Section 7.12D (July 2022).

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:

a) PDF electronic file.
b) Three paper copies of product schedule or list, unless otherwise indicated. Architect will return two copies.

6. WARRANTIES, See General Conditions Section 7.14 (July 2022).

a. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

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 the Project Manual.

1) Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
2) Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3) Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4) Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document.

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

PART 2 PRODUCTS

1. MATERIALS

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

PART 3 EXECUTION

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 portion of Project:

a) Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

b) Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c) Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

d) Remove tools, construction equipment, machinery, and surplus material from Project site.

e) Remove snow and ice to provide safe access to building.

f) Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

g) Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

h) Sweep concrete floors broom clean in unoccupied spaces.

i) Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision- obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

j) Remove labels that are not permanent.

k) Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.

l) Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

m) Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

n) Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

o) Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

p) Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.

1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report upon completion of cleaning.

q) Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and

defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

r) Leave Project clean and ready for occupancy.

c. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

d. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."

END OF SECTION

SECTION 017823
OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

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.

2. SUMMARY

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

1) Operation and maintenance documentation directory.
2) Emergency manuals.
3) Operation manuals for systems, subsystems, and equipment.
4) Product maintenance manuals.
5) Systems and equipment maintenance manuals.

b. Related Sections:

1) Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals
2) Divisions 02 through 49 Sections, where applicable, for specific operation and maintenance manual requirements for the Work in those Sections.

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.

4. CLOSEOUT SUBMITTALS

a. Manual Content: Operations and maintenance manual content is specified in individual specification sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1) Where applicable, clarify and update reviewed manual content to correspond to modifications and field conditions.

b. Format: Submit operations and maintenance manuals in the following format:

1) PDF electronic file. Assemble each manual into a composite electronically- indexed file. Submit on digital media acceptable to Architect.

a) Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically-linked operation and maintenance directory.
b) Enable inserted reviewer comments on draft submittals.

2) Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.

c. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

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

1) Correct or modify 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.

PART 2 PRODUCTS

1. OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

a. Organization: Include a section in the directory for each of the following:

1) List of documents.
2) List of systems.
3) List of equipment.
4) Table of contents.

b. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

c. 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.

d. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

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."

2. REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

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

1) Title page.
2) Table of contents.
3) Manual contents.

b. Title Page: 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 Architect.
7) Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
8) Cross-reference to related systems in other operation and maintenance manuals.

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

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

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

e. 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: Enable bookmarking of individual documents based upon 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 upon opening file.

f. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1) Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280- mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a) If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
b) Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name and subject matter of contents. Indicate volume number for multiple-volume sets.

2) Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross- referenced to Specification Section number and title of Project Manual.
3) Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.

4) Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
5) Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

a) If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
b) If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

3. EMERGENCY MANUALS

a. Content: Organize manual into a separate section for each of the following:

1) Type of emergency.
2) Emergency instructions.
3) Emergency procedures.

b. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1) Fire.
2) Flood.
3) Gas leak.
4) Water leak.
5) Power failure.
6) Water outage.
7) System, subsystem, or equipment failure.
8) Chemical release or spill.

c. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

d. Emergency Procedures: Include the following, as applicable:

1) Instructions on stopping.
2) Shutdown instructions for each type of emergency.
3) Operating instructions for conditions outside normal operating limits.
4) Required sequences for electric or electronic systems.
5) Special operating instructions and procedures.

4. OPERATION MANUALS

a. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1) System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2) Performance and design criteria if Contractor is delegated design responsibility.
3) Operating standards.
4) Operating procedures.
5) Operating logs.
6) Wiring diagrams.

7) Control diagrams.
8) Piped system diagrams.
9) Precautions against improper use.
10) License requirements including inspection and renewal dates.

b. Descriptions: Include the following:

1) Product name and model number. Use designations for products indicated on Contract Documents.
2) Manufacturer's name.
3) Equipment identification with serial number of each component.
4) Equipment function.
5) Operating characteristics.
6) Limiting conditions.
7) Performance curves.
8) Engineering data and tests.
9) Complete nomenclature and number of replacement parts.

c. Operating Procedures: Include the following, as applicable:

1) Startup procedures.
2) Equipment or system break-in procedures.
3) Routine and normal operating instructions.
4) Regulation and control procedures.
5) Instructions on stopping.
6) Normal shutdown instructions.
7) Seasonal and weekend operating instructions.
8) Required sequences for electric or electronic systems.
9) Special operating instructions and procedures.

d. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

e. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

5. PRODUCT MAINTENANCE MANUALS

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

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

c. Product Information: Include the following, as applicable:

1) Product name and model number.
2) Manufacturer's name.

3) Color, pattern, and texture.
4) Material and chemical composition.
5) Reordering information for specially manufactured products.

d. Maintenance Procedures: Include manufacturer's written recommendations and 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.

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

f. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1) Include procedures to follow and required notifications for warranty claims.

6. SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

a. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

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

c. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1) Standard maintenance instructions and bulletins.
2) Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3) Identification and nomenclature of parts and components.
4) List of items recommended to be stocked as spare parts.

d. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1) Test and inspection instructions.
2) Troubleshooting guide.
3) Precautions against improper maintenance.
4) Disassembly; component removal, repair, and replacement; and reassembly instructions.
5) Aligning, adjusting, and checking instructions.
6) Demonstration and training video recording, if available.

e. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1) Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2) Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

f. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

g. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

h. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1) Include procedures to follow and required notifications for warranty claims.

PART 3 EXECUTION

1. MANUAL PREPARATION

a. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

b. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

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

d. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1) Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2) Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

e. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1) Prepare supplementary text if manufacturers' standard printed data are not available and

where the information is necessary for proper operation and maintenance of equipment or systems.

f. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1) Do not use original project record documents as part of operation and maintenance manuals.
2) Comply with requirements of newly prepared record Drawings in Division 01 Section "Project Record Documents."

g. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 017839
PROJECT RECORD DOCUMENTS

PART 1 GENERAL

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.

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 Sections:

1) Division 01 Section "Execution" for final property survey.
2) Division 01 Section "Closeout Procedures" for general closeout procedures.
3) Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
4) Divisions 02 through 49 Sections for specific requirements for project record documents of the Work in those Sections.

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: Submit one paper copy set of marked-up record prints and one set of plots from corrected record digital data files. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
b) Final Submittal: Submit one paper copy set of marked-up record prints. Print each Drawing, whether or not changes and additional information were recorded.

b. Record Specifications: Submit one paper copy of Project's Specifications, including addenda and contract modifications.

c. Record Product Data: Submit one (1) paper copies 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: Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy of each submittal.

e. Reports: Submit written report indicating items incorporated in Project record documents concurrent with progress of the Work, including modifications, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 PRODUCTS

1. RECORD DRAWINGS

a. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings.

1) Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a) Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b) Accurately record information in an acceptable drawing technique.
c) Record data as soon as possible after obtaining it.
d) Record and check the markup before enclosing concealed installations.
e) Cross-reference record prints to corresponding archive photographic documentation.

2) Content: Types of items requiring marking include, but are not limited to, the following:

a) Dimensional changes to Drawings.
b) Revisions to details shown on Drawings.
c) Depths of foundations below first floor.
d) Locations and depths of underground utilities.
e) Revisions to routing of piping and conduits.
f) Revisions to electrical circuitry.
g) Actual equipment locations.
h) Duct size and routing.
i) Locations of concealed internal utilities.
j) Changes made by Change Order or Construction Change Directive.
k) Changes made following Architect's written orders.
l) Details not on the original Contract Drawings.
m) Field records for variable and concealed conditions.
n) Record information on the Work that is shown only schematically.

3) Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.
4) Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5) Mark important additional information that was either shown schematically or omitted from original Drawings.
6) Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

b. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings

where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1) New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2) Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

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

1) Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2) Format: Annotated PDF electronic file with comment function enabled.
3) Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4) Identification: As follows:

a) Project name.
b) Date.
c) Designation "PROJECT RECORD DRAWINGS."
d) Name of Architect.
e) Name of Contractor.

2. RECORD SPECIFICATIONS

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

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

b. Format: Submit record Specifications as paper copy.

3. RECORD PRODUCT DATA

a. 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.

b. Format: Submit record Product Data as paper copy.

1) Include record Product Data directory organized by specification section number and title, electronically linked to each item of record Product Data.

4. MISCELLANEOUS RECORD SUBMITTALS

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

b. Format: Submit miscellaneous record submittals as paper copy.

1) Include miscellaneous record submittals directory organized by specification section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 EXECUTION

1. RECORDING AND MAINTENANCE

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

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

END OF SECTION

SECTION 017900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

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.

2. SUMMARY

a. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1) Demonstration of operation of systems, subsystems, and equipment.
2) Training in operation and maintenance of systems, subsystems, and equipment.
3) Demonstration and training video recordings.

b. Related Sections:

1) Divisions 02 through 49 Sections, where applicable, for specific requirements for demonstration and training for products in those Sections.

3. INFORMATIONAL SUBMITTALS

a. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1) Indicate proposed training modules utilizing manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

b. Qualification Data: For facilitator.

c. Attendance Record: For each training module, submit list of participants and length of instruction time.

d. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

4. CLOSEOUT SUBMITTALS

a. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1) Identification: On each copy, provide an applied label with the following information:

a) Name of Project.
b) Name and address of videographer.
c) Name of Architect.
d) Name of Contractor.
e) Date of video recording.

2) Transcript: Prepared on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in heavy-duty, three-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
3) At completion of training, submit complete training manual(s) for Owner's use.

5. QUALITY ASSURANCE

a. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

b. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

c. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1) Inspect and discuss locations and other facilities required for instruction.
2) Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3) Review required content of instruction.
4) For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

6. COORDINATION

a. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

b. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

c. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 PRODUCTS

1. INSTRUCTION PROGRAM

a. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

b. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1) Basis of System Design, Operational Requirements, and Criteria: Include the following:

   a) System, subsystem, and equipment descriptions.
   b) Performance and design criteria if Contractor is delegated design responsibility.
   c) Operating standards.
   d) Regulatory requirements.
   e) Equipment function.
   f) Operating characteristics.
   g) Limiting conditions.
   h) Performance curves.

2) Documentation: Review the following items in detail:

   a) Emergency manuals.
   b) Operations manuals.
   c) Maintenance manuals.
   d) Project record documents.
   e) Identification systems.
   f) Warranties and bonds.
   g) Maintenance service agreements and similar continuing commitments.

3) Emergencies: Include the following, as applicable:

   a) Instructions on meaning of warnings, trouble indications, and error messages.
   b) Instructions on stopping.
   c) Shutdown instructions for each type of emergency.
   d) Operating instructions for conditions outside of normal operating limits.
   e) Sequences for electric or electronic systems.
   f) Special operating instructions and procedures.

4) Operations: Include the following, as applicable:

   a) Startup procedures.
   b) Equipment or system break-in procedures.
   c) Routine and normal operating instructions.
   d) Regulation and control procedures.
   e) Control sequences.
   f) Safety procedures.
   g) Instructions on stopping.
   h) Normal shutdown instructions.
   i) Operating procedures for emergencies.
   j) Operating procedures for system, subsystem, or equipment failure.
   k) Seasonal and weekend operating instructions.
   l) Required sequences for electric or electronic systems.
   m) Special operating instructions and procedures.

5) Adjustments: Include the following:

   a) Alignments.
   b) Checking adjustments.
   c) Noise and vibration adjustments.

d) Economy and efficiency adjustments.

6) Troubleshooting: Include the following:

a) Diagnostic instructions.
b) Test and inspection procedures.

7) Maintenance: Include the following:

a) Inspection procedures.
b) Types of cleaning agents to be used and methods of cleaning.
c) List of cleaning agents and methods of cleaning detrimental to product.
d) Procedures for routine cleaning
e) Procedures for preventive maintenance.
f) Procedures for routine maintenance.
g) Instruction on use of special tools.

8) Repairs: Include the following:

a) Diagnosis instructions.
b) Repair instructions.
c) Disassembly; component removal, repair, and replacement; and reassembly instructions.
d) Instructions for identifying parts and components.
e) Review of spare parts needed for operation and maintenance.

PART 3 EXECUTION

1. PREPARATION

a. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 01 Section "Operations and Maintenance Data."

b. Set up instructional equipment at instruction location.

2. INSTRUCTION

a. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

b. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1) Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2) Owner will furnish an instructor to describe Owner's operational philosophy.
3) Owner will furnish Contractor with names and positions of participants.

c. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1) Schedule training with Owner with at least seven days' advance notice.

d. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

e. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3. DEMONSTRATION AND TRAINING VIDEO RECORDINGS

a. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1) At beginning of each training module, record each chart containing learning objective and lesson outline.

b. Video Recording Format: Provide high-quality color video recordings with menu navigation in format acceptable to Architect.

c. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.

d. Narration: Describe scenes on video recording by dubbing audio narration off-site after video recording is recorded. Include description of items being viewed.

e. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

f. Pre-Produced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION

SECTION 024119

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 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.

1.2 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.

1.3 INFORMATIONAL SUBMITTALS

A. Predemolition photographs.

1.4 CLOSEOUT SUBMITTALS

A. Inventory of items that have been removed and salvaged.

1.5 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.

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

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

G. Arrange selective demolition schedule so as not to interfere with Owner's operations.

1.6 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.

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. Inventory and record the condition of items to be removed and salvaged.

3.2 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 HVAC systems, equipment, 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.

b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.

c. Equipment to Be Removed: Disconnect and cap services and remove equipment.

d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.3 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.

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

3.4 SELECTIVE DEMOLITION

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. 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.

2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

3. 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.

4. Maintain fire watch during and for at least (1) hour after flame-cutting operations.

5. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

6. Dispose of demolished items and materials promptly.

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. 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.

D. 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.

E. 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.

3.5 CLEANING

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.

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.

B. Burning: Do not burn demolished materials.

C. 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

SECTION 033000
CAST-IN-PLACE-CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Provide cast-in-place concrete, reinforcing and accessories.

1.2 SUBMITTALS

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

B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.
1. Shop drawings shall be prepared and stamped by a qualified engineer licensed in the jurisdiction of the project.

C. Mix Design: Submit for approval mix design proposed for use.

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Testing: Employ an independent testing agency acceptable to Owner to design concrete mixes and to perform material evaluation tests. Provide 7 and 28 day cylinder tests. Comply with ASTM C 143, C 173, C 31 and C 39.

C. Standards:
1. ACI 301, Specifications for structural Concrete for Buildings.
2. ACI 318, Building Code Requirements for Reinforced Concrete, and CRSI Manual of Standard Practice.

D. Mock-Ups: Provide mock-up as required to demonstrate quality of workmanship.

E. Floor Flatness and Levelness Tolerances:
1. Subfloors Under Materials Such as Concrete Toppings, Ceramic Tile, and Sand Bed Terrazzo: ACI 302.1R and ASTM E 1155, floor flatness (Ff) of 15, floor levelness (Fl) of 13.
2. Subfloors Under Materials Such As Vinyl Tile, Epoxy Toppings, Paint, and Carpet: ACI 302.1R and ASTM E 1155, floor flatness (Ff) of 20, floor levelness (Fl) of 17.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cast-In-Place Concrete:
1. Manufacturers: Concrete Forming and Accessories:Architectural Polymers;ISE Logik Industries;MAPEI;Solomon Colors;Spec Formliners, Inc..
2. Manufacturers: Concrete Anchoring: Refer

towww.arcat.com/divs/sec/sec03300.html

3. Manufacturers: Concrete Finishes:EPMAR Corporation;LATICRETE International, Inc..
4. Manufacturers: Concrete Curing, Sealing and Hardening:ISE Logik Industries.
5. Manufacturers: Cement Grouts, Adhesives and Sealants:MAPEI.
6. Manufacturers: Concrete Resurfacing and Rehabilitation:LATICRETE International, Inc..
7. Application: Exterior site concrete and interior slab on grade.
8. Finish for Exterior Concrete Platforms, Steps, Ramps and Sloped Walls: Non-slip broom finish.
9. Cast-In-Place Concrete Reinforcing and Accessories:

a. Concrete Design Mixes: ASTM C 94, 28 day compressive strength suitable for project requirements and site conditions.
b. Formwork: Plywood or metal panel formwork sufficient for structural and visual requirements.
c. Reinforcing Bars: ASTM A 767, Class II, galvanized.
d. Steel Wire: ASTM A 82.
e. Steel Wire Fabric: ASTM A 497, welded, deformed.
f. Concrete Materials: ASTM C 150, Type I, Portland cement; potable water.
g. Concrete Admixtures: Containing less than 0.1 percent chloride ions.
h. Reglets: Galvanized sheet steel reglets, minimum 26 gauge (.018 inch).
i. Waterstops: Rubber, PVC or self expanding butyl/bentonite waterstops.
j. Vapor Retarder: ASTM D 4397 polyethylene sheet, 10 mils.
k. Liquid Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class A.
l. Underlayment Compound: Free-flowing, self-leveling cement-based compound.
m. Bonding Compound: Polyvinyl acetate or acrylic base.
n. Epoxy Adhesive: ASTM C 881, two-component material.

PART 3 EXECUTION

3.1 INSTALLATION

A. Comply with ASTM C 94. Do not change mix design without approval. Calcium chloride admixtures are not permitted.

B. Chamfer exposed edges/corners to provide straight lines.

C. Tolerance: Plus 1/8" in 10" for grade, alignment, and straightness.

D. Construction Joints: Use keyways, continue reinforcement through joint.

E. Expansion Joints: For exterior work locate 30' o.c. at approved locations. Provide smooth dowels across joint which permit 1" horizontal movement and no vertical shear movement.

F. Isolation Joints: Provide between slabs and vertical elements such as columns and structural walls.

G. Control Joints: Provide sawn or tooled joints or removeable insert strips; depth equal to 1/4 slab thickness. Spacing as required and approved.

H. Wall Finishes: As-cast and patched for concealed work; rubbed smooth, filled and cement paste coated for exposed work.

I. Slab Finishes: Obtain sample approval before beginning work.
1. Scratch: For surfaces to receive mortar setting beds or cementitious flooring materials.

2. Trowel: Hard, smooth, uniform surface for areas to receive resilient flooring, carpet, or other thin finish material.
3. Broom: After trowel finishing, roughen surface by fine brooming perpendicular to traffic direction for exposed exterior walks, steps and ramps.
4. Non-Slip Aggregate: After trowel finishing, uniformly trowel 25-lbs./100 s. f. of damp non-slip aggregate into surface. Cure, then rub lightly to expose aggregate. Use for interior exposed concrete stairs and ramps.
5. Exposed Aggregate: Use chemical retarder or tamp aggregate into wet concrete and expose by brushing with water. Use where indicated.
6. Hardener Finish: For exposed interior concrete floors. Follow manufacturer's directions.

J. Cure and protect work. Report defective work in writing.

END OF SECTION

SECTION 033500
CONCRETE FINISHING

PART 1 GENERAL

1.1 SUMMARY

A. Provide finishing materials and operations for cast-in-place concrete.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Mock-Ups: Provide mock-up as required to demonstrate appearance and quality of workmanship.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cast-In-Place Concrete:
1. Manufacturers: Concrete Finishes:Hycrete, Inc.;ISE Logik Industries;LATICRETE International, Inc.;Solomon Colors;Stone Edge Surfaces.
2. Manufacturers: Concrete Curing, Sealing and Hardening:Hycrete, Inc.;ISE Logik Industries;Stone Edge Surfaces.
3. Application: Exterior site concrete and interior slab on grade.
4. Sealed Concrete Materials: Concrete hardener/densifier.

PART 3 EXECUTION

3.1 INSTALLATION

A. Slab Finishes: Obtain sample approval before beginning work.
1. Sealed Concrete: Natural finish, slight darkening acceptable.

B. Protect work with suitable covering for the duration of the construction period. Report defective work in writing.

END OF SECTION

SECTION 061000
ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Provide rough carpentry.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Lumber Standards and Grade Stamps: DOC PS 20, American Softwood Lumber Standard and inspection agency grade stamps.

C. Construction Panel Standards: DOC PS 1, U.S. Product Standard for Construction and Industrial Plywood; APA PRP-108.

D. Wood Framing Standards: NFPA House Framing Manual.
1. Interior Wall Framing: 2 inch by 4-inch (38 mm by 89 mm actual) studs, 16 inches (40 cm) on center.

E. Preservative Treatment: AWPA C2 for lumber and AWPA C9 for plywood; waterborne pressure treatment. Provide for wood in contact with soil, concrete, masonry, roofing, flashing, dampproofing and waterproofing.

F. Fire-Retardant Treatment: AWPA C20 for lumber and AWPA C27 for plywood; noncorrosive type. Provide at building interior where required by code.

PART 2 PRODUCTS

2.1 MATERIALS

A. Rough Carpentry Applications:
1. Manufacturers, Dimensional Lumber:Humboldt Sawmill;Roseburg.
2. Manufacturers, Pressure-Treated Wood Products:Allweather Wood;Viance - Treated Wood Solutions.
3. Manufacturers, Fire-Retardant Treated Wood Products:Fire Retardant Coatings of Texas, LLC;Viance - Treated Wood Solutions.
4. Manufacturers, Mold Prevention Treatment: Refer towww.arcat.com/divs/sec/sec06100.html
5. Application: Framing with dimension lumber.
6. Application: Wood grounds, nailers, and blocking.
7. Dimension Lumber:

a. Light Framing: Stud, No. 3 or Standard grade.
b. Structural Framing: No. 1 grade.

c. Species: Any species of grade indicated.
d. Exposed Framing: Appearance grade.

8. Building Wrap:

a. Material: Air-retarder sheeting made from polyolefins; cross-laminated films, woven strands, or spun-bonded fibers; coated or uncoated; with or without perforations; ASTM E 1677, Type I.

9. Sill Sealer Gaskets:

a. Material: Glass fiber strip resilient insulation.

10. Framing Anchors and Fasteners:

a. Material: Non-corrosive, suitable for load and exposure. Drywall screws are not acceptable.

PART 3 EXECUTION

3.1 INSTALLATION

A. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.

B. Plywood: Comply with applicable recommendations contained in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial"

C. Provide nailers, blocking and grounds where required. Set work plumb, level and accurately cut.

D. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with other work.

E. Comply with manufacturer's requirements for cutting, handling, fastening and working treated materials.

F. Restore damaged components. Protect work from damage.

END OF SECTION

SECTION 072100
THERMAL INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Provide thermal insulation and vapor retarders.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Spray-Applied Polyurethane Insulation:
   1. Manufacturer:Armatherm;BASF Corporation - Spray Foam;Carlisle Spray Foam Insulation;ICP Adhesives & Sealants Inc..
   2. Application: Exterior walls.
   3. Standard: ASTM C 1029.
   4. Insulation Value: R-7 per inch, Min.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with work of other sections. Provide full thickness in one layer over entire area, tightly fitting around penetrations.

B. Protect installed insulation.

END OF SECTION

SECTION 079200
JOINT SEALANTS

PART 4 - GENERAL

4.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Solvent-release-curing joint sealants.
5. Acoustical joint sealants.
6. Preformed seals.

4.2 RELATED REQUIREMENTS

1. Section 08 80 00 "Glazing" for glazing sealants.

4.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate installation of joint sealants with cleaning of joint sealant substrates and other operations that may impact installation or finished joint sealant work.

4.4 ACTION SUBMITTALS

A. Product Data: For each type of joint sealant product specified, including:

1. Preparation instructions and recommendations.

B. Samples for Color Selection: For each joint sealant type.

C. Samples for Verification: For each exterior joint sealant product, for each color selected.

4.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified applicator.

B. Warranty: Sample of unexecuted manufacturer and installer special warranties.

C. Preconstruction Compatibility and Adhesion Test Reports: From manufacturer. Include written interpretation of reports and recommendations for primers and substrate preparation.

D. Field quality control adhesion test reports.

4.6 QUALITY ASSURANCE

A. Installer Qualifications: Company with minimum of three years experience specializing in work of this section, employing applicators trained for application of joint sealants required for this project, with record of successful completion of projects of similar scope, and approved by manufacturer.

B. Single Source Responsibility: Provide exterior joint sealants by a single manufacturer responsible for testing of Project substrates to verify compatibility and adhesion of joint sealants.

C. Preconstruction Manufacturer Laboratory Compatibility, Staining, and Adhesion Testing: Submit samples of each substrate or adjacent material that will be in contact with or affect joint sealants. Current manufacturer test data of products on matching substrates will be acceptable.

1. Adhesion: Use ASTM C 719 and ASTM C 794 to determine requirements for joint preparation, including cleaning and priming.
2. Compatibility: Use ASTM C 1087 to determine materials forming joints and adjacent materials do not adversely affect sealant materials and do not affect sealant color.
3. Stain Testing: Use ASTM C 510, ASTM C 1248, or ASTM D 2203 to verify non-staining characteristics of proposed sealants on specified substrates.
4. Pre-construction manufacturer laboratory testing is not required when sealant manufacturer can furnish data acceptable to Architect based on previous testing for materials matching those of the Work.

D. Preconstruction Field-Adhesion Testing: Prior to installing joint sealants, field test adhesion to joint substrates using ASTM C 1193 Method A. Verify adhesion is adequate. Modify joint preparation recommendations for failed joints and re-test. Submit written test report.

4.7 DELIVERY, STORAGE AND HANDLING

A. Accept materials on site in manufacturer's unopened original packaging.

B. Store primers and sealants in dry location with ambient temperature range of 60 to 80 deg. F (15 to 27deg. C).

4.8 ENVIRONMENTAL REQUIREMENTS

A. Do not install primers or sealants when atmospheric temperatures or joint surface temperatures are less than 40 deg. F (4 deg. C).

4.9 SCHEDULING

A. Schedule work so waterproofing, water repellents and preservative finishes are installed after sealants, unless sealant manufacturer approves otherwise in writing.

B. Ensure sealants are cured before covering with other materials.

4.10 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which joint sealant manufacturer agrees to furnish joint sealants to repair or replace those that demonstrate deterioration or adhesive or cohesive failure under normal use within warranty period specified.

1. Warranty Period for Silicone Sealants: Five years date of Substantial Completion.

B. Special Installer's Warranty: Original statement on Installer's letterhead in which Installer agrees to repair or replace joint sealants that demonstrate deterioration or failure within warranty period specified.

1. Warranty Period: Two years from date of Substantial Completion.

PART 5 - PRODUCTS

5.1 MANUFACTURERS

A. Basis-of-Design Products: Provide joint sealant products manufactured by Tremco, Inc., Commercial Sealants and Waterproofing Division, An RPM Company, Beachwood OH; (866) 321-6357; email: techresources@tremcoinc.com; www.tremcosealants.com.

5.2 MATERIALS, GENERAL

A. VOC Content for Interior Applications: Provide sealants and sealant primers complying with the following VOC content limits per 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

B. Low-Emitting Sealants for Interior Applications: Provide sealants and sealant primers complying 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. Compatibility: Provide joint sealants and accessory materials that are compatible with one another, and with adjacent materials, as demonstrated by sealant manufacturer using ASTM C 1087 testing and related experience.

D. Joint Sealant Standard: Comply with ASTM C 920 and other specified requirements for each joint sealant.

E. Stain Test Characteristics: Where sealants are required to be nonstaining, provide sealants tested per ASTM C 1248 as non-staining on porous joint substrates specified.

5.3 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Non-Staining, Moisture-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, Use NT; SWRI validated.

1. Basis of Design Product: Tremco, Inc., Spectrem 1.
2. Volatile Organic Compound (VOC) Content: 1 g/L maximum.
3. Volatile Organic Emissions (VOE): Not greater than Greenguard Children & Schools Certification emissions levels.
4. Staining, ASTM C 1248: None on concrete, marble, granite, limestone, and brick.
5. Color: As selected by Architect from manufacturer's standard line of not less than 12 colors.

B. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Basis of Design Product: Tremco, Inc., Tremsil 200 Sanitary.
2. Volatile Organic Compound (VOC) Content: 1 g/L maximum.
3. Volatile Organic Emissions (VOE): Not greater than Greenguard Children & Schools Certification emissions levels.
4. Color: White and Clear.

5.4 URETHANE JOINT SEALANTS

A. Single-Component, Nonsag, Moisture-Cure, Polyurethane Hybrid Joint Sealant: ASTM C 920, Type S, Grade NS, Class 35, Use NT; Greenguard certified.

1. Basis of Design Product: Tremco, Inc., Dymonic FC.
2. Extrusion Rate ASTM C1183: 93.1 mL/min
3. Weight Loss ASTM C1246: Pass
4. Tack Free Time ASTM C679: 3 to 4 hr
5. Volatile Organic Compound (VOC) Content: 10 g/L maximum.
6. Volatile Organic Emissions (VOE): Not greater than Greenguard Children & Schools Certification emissions levels.
7. Color: As selected by Architect from manufacturer's standard line of not less than 15 colors.

5.5 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Basis of Design Product: Tremco, Inc., Tremflex 834.
2. Volatile Organic Compound (VOC) Content: 35 g/L maximum.
3. Volatile Organic Emissions (VOE): Not greater than Greenguard Children & Schools Certification emissions levels.
4. Color: White, paintable.

5.6 SOLVENT-RELEASE-CURING JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealant: ASTM C 1311.

1. Basis of Design Product: Tremco, Inc., Tremco Butyl Sealant.
2. Volatile Organic Compound (VOC) Content: 250 g/L maximum.
3. Color: As selected by Architect from manufacturer's standard colors.

5.7 ACOUSTICAL SEALANTS

A. Acoustical/Curtainwall Sealant: Single-component, non-hardening, non-sag, paintable synthetic rubber-tested to reduce airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing of similar assemblies according to ASTM E 90.

1. Basis of Design Product: Tremco, Inc., Tremco Acoustical/Curtainwall Sealant.
2. Volatile Organic Compound (VOC) Content: 160 g/L maximum.
3. Color: White, paintable.

5.8 PRE-FORMED SEALS

A. Preformed Silicone Joint Seals: Manufacturer's standard seal consisting of precured low-modulus silicone extrusion, in sizes to fit applications indicated on Drawings, combined with a neutral-curing liquid silicone sealant for bonding seals to substrates.

1. Basis of Design Product: Tremco, Inc.; Spectrem SimpleSeal.

5.9 JOINT SEALANT ACCESSORIES

A. Cylindrical Sealant Backing: ASTM C 1330, Type B non-absorbent, bi-cellular material with surface skin, or Type O open-cell polyurethane, as recommended by sealant manufacturer for application.

B. Bond Breaker Tape: Polymer tape compatible with joint sealant and adjacent materials and recommended by sealant manufacturer.

C. Joint Substrate Primers: Substrate primer recommended by sealant manufacturer for application.

D. Cleaners: Chemical cleaners acceptable to joint sealant manufacturer.

E. Masking tape: Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces.

PART 6 - EXECUTION

6.1 EXAMINATION

A. Examine joint profiles and surfaces to determine if work is ready to receive joint sealants. Verify joint dimensions are adequate for development of sealant movement capability. Verify joint surfaces are clean, dry, and adequately cured. Proceed with joint sealant work once conditions meet sealant manufacturer's written recommendations.

6.2 PREPARATION

A. Joint Surface Cleaning: Clean joints prior to installing joint sealants using materials and methods recommended by sealant manufacturer. Comply with ASTM C 1193.

1. Remove curing compounds, laitance, form-release agents, dust, and other contaminants.
2. Clean nonporous and porous surfaces utilizing chemical cleaners acceptable to sealant manufacturer.
3. Protect elements surrounding the Work of this section from damage or disfiguration. Apply masking tape to adjacent surfaces when required to prevent damage to finishes from sealant installation.

6.3 SEALANT APPLICATION

A. Sealant and Primer Installation Standard: Comply with ASTM C 1193 and manufacturer's written instructions.

B. Joint Backing: Select joint backing materials recommended by sealant manufacturer as compatible with sealant and adjacent materials. Install backing material at depth required to produce profile of joint sealant allowing optimal sealant movement.

1. Install joint backing to maintain the following joint ratios:

a. Joints up to 1/2 inch (13 mm) wide: 1:1 width to depth ratio.
b. Joints greater than 1/2 inch (13 mm) wide: 2:1 width to depth ratio; maximum 1/2 inch (13 mm) joint depth.

2. Install bond breaker tape over substrates when sealant backings are not used.

C. Masking: Mask adjacent surfaces to prevent staining or damage by contact with sealant or primer.

D. Joint Priming: Prime joint substrates when recommended by sealant manufacturer or when indicated by preconstruction testing or experience. Apply recommended primer using sealant manufacturer's recommended application techniques.

E. Liquid Sealant Application: Install sealants using methods recommended by sealant manufacturer, in depths recommended for application. Apply in continuous operation from bottom to top of joint

vertically and horizontally in a single direction. Apply using adequate pressure to fill and seal joint width.

1. Tool sealants immediately with appropriately shaped tool to force sealants against joint backing and joint substrates, eliminating voids and ensuring full contact.
2. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
3. Tool exposed joint surface concave using tooling agents approved by sealant manufacturer for application.

F. Cleaning: Remove excess sealant using materials and methods approved by sealant manufacturer that will not damage joint substrate materials.

1. Remove masking tape immediately after tooling joint without disturbing seal.
2. Remove excess sealant from surfaces while still uncured.

G. Installation of Acoustical Sealant: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations on both sides of assemblies with a continuous bead of acoustical sealant. Comply with ASTM C 919 and with manufacturer's written recommendations.

H. Installation of Preformed Seals: Install seals immediately after removing protective wrapping. Do not stretch or misshape material. Place seals to provide continuity at ends, turns, and intersections. Apply heat to sealant when recommended by sealant manufacturer's written instructions.

6.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Perform adhesion tests in accordance with manufacturer's instructions and with ASTM C 1193, Method A.

1. Perform [5] tests for the first [1000 feet (300 m)] of joint length for each kind of sealant and joint substrate, and one test for each [1000 feet (300 m)] of joint length thereafter or 1 test per each floor per building elevation, minimum.
2. For sealant applied between dissimilar materials, test both sides of joint.

B. Remove sealants failing adhesion test, clean substrates, reapply sealants, and re-test. Test adjacent sealants to failed sealants.

C. Submit report of field adhesion testing to Architect indicating tests, locations, dates, results, and remedial actions taken.

6.5 EXTERIOR JOINT-SEALANT SCHEDULE

A. Exterior concealed transition joints in air barrier.
1. Joint Sealant: Single-component neutral-curing low-modulus silicone sealant.
2. Basis of Design Product: Tremco, Inc., Spectrem 1.
3. Compatibility: Compatible with air barrier components.

B. Exterior joints within exterior insulation finish systems (EIFS).

1. Joint Sealant: Single-component neutral-curing non-staining silicone sealant.
2. Basis of Design Product: Tremco, Inc., Spectrem 1.
3. Joint-Sealant Color: As selected by Architect from manufacturer's standard colors.

C. Exterior exposed joints in metal panel cladding systems.

1. Joint Sealant: Single-component neutral-curing non-staining silicone sealant.

2. Basis of Design Product: Tremco, Inc., Spectrem 1.
3. Joint-Sealant Color: As selected by Architect from manufacturer's standard colors.

D. Exterior concealed watertight joints in cladding systems.

1. Joint Sealant: Single-component neutral-curing silicone sealant.
2. Basis of Design Product: Tremco, Inc., Spectrem 1.

E. Exterior joints between different materials listed above.

1. Joint Sealant: Single-component neutral-curing non-staining silicone sealant.
2. Basis of Design Product: Tremco, Inc., Spectrem 1.
3. Joint-Sealant Color: As selected by Architect from manufacturer's standard colors.

F. Exterior perimeter joints at frames of doors, windows, storefront frames, curtain wall frames, and louvers.

1. Joint Sealant: Single-component neutral-curing non-staining silicone sealant.
2. Basis of Design Product: Tremco, Inc., Spectrem 1.
3. Joint-Sealant Color: As selected by Architect from manufacturer's standard colors.

G. Exterior joints within aluminum storefront framing, curtain walls, and window systems:

1. Joint Sealant: Single-component neutral-curing non-staining silicone sealant.
2. Basis of Design Product: Tremco, Inc., Spectrem 1.
3. Joint-Sealant Color: As selected by Architect from manufacturer's standard colors.

H. Exterior joints within structural glazing, aluminum storefront framing, curtain walls, and window systems: Refer to Division 08 Section "Glazing Sealants".

I. All other exterior non-traffic joints.

1. Joint Sealant: Single-component neutral-curing non-staining silicone sealant.
2. Basis of Design Product: Tremco, Inc., Spectrem 1.
3. Joint-Sealant Color: As selected by Architect from manufacturer's standard colors.

6.6 INTERIOR JOINT-SEALANT SCHEDULE

A. Interior perimeter joints of exterior aluminum frames.

1. Joint Sealant: Single-component non-sag urethane sealant.
2. Basis of Design Product: Tremco, Inc., Dymonic FC.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

B. Interior perimeter joints of interior frames.

1. Joint Sealant: Single-component non-sag urethane sealant.
2. Joint Sealant: Siliconized acrylic latex.
3. Basis of Design Product: Tremco, Inc., Dymonic FC.
4. Joint-Sealant Color: Paintable.

C. Interior non-moving joints between interior painted surfaces and adjacent materials.

1. Joint Sealant: Siliconized acrylic latex.
2. Basis of Design Product: Tremco, Inc., Tremflex 834.
3. Joint-Sealant Color: Paintable.

D. Interior concealed sealants at thresholds and sills.

1. Joint Sealant: Butyl-rubber-based joint sealant.
2. Basis of Design Product: Tremco, Inc., Butyl Sealant.

E. Interior exposed and non-exposed acoustical applications:

1. Joint Sealant: Acoustical joint sealant.
2. Basis of Design Product: Tremco, Inc., Acoustical/Curtainwall Sealant.

END OF SECTION

SECTION 081113

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Provide steel doors and frames.

1.2 SUBMITTALS

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

B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Standards: ANSI/SDI-100, Recommended Specifications for Standard Steel Doors and Frames.

C. Performance Standards:
1. Fire-Rated Assemblies: NFPA 80, and acceptable testing agency listing.
2. Thermal-Rated Assemblies at Exterior: ASTM C 236 or ASTM C 976.
3. Sound-Rated Assemblies at Mechanical Rooms: ASTM E 1408, and ASTM E 413.

PART 2 PRODUCTS

2.1 MATERIALS

A. Exterior Steel Doors:
1. Manufacturers:AMBICO LIMITED;Galaxy Metal Products;Novatech Group;THERMA-TRU DOORS.
2. Material: Minimum 16-gauge galvanized steel sheet.
3. Door Thickness: 1-3/4 inches, thermally insulated.
4. Finish: Factory primed, and field painted.
5. Accessories:

a. Silencers.

B. Exterior Steel Frames:
1. Manufacturers:AMBICO LIMITED;Dunbarton Corporation;Galaxy Metal Products;THERMA-TRU DOORS.
2. Material: Minimum 14-gauge galvanized steel sheet.
3. Corners: Mitered or coped.
4. Type: Knockdown.
5. Finish: Factory primed, and field painted.

PART 3 EXECUTION

3.1 INSTALLATION

A. Fabricate work to be rigid, neat and free from seams, defects, dents, warp, buckle, and exposed fasteners. Install doors and frames in compliance with SDI-100, NFPA 80, and requirements of authorities having jurisdiction.

B. Provide thermally improved doors with maximum U-value of 0.24 BTU/hr./sq. ft. degree F (ASTM C 236) for all exterior doors and elsewhere as noted.

C. Provide acoustically improved doors with minimum STC of 33 (ASTM E 90 and ASTM E 413) where indicated.

D. Hardware: Prepare doors and frames to receive hardware on final schedule.

E. Shop Finish: Clean, treat and prime paint all work with rust-inhibiting primer comparable with finish paint specified in Division 9 section. Provide asphalt emulsion sound deadening coating on concealed frame interiors.

F. Touch-up damaged coatings ready to receive finish painting.

END OF SECTION

SECTION 087100
DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

A. Provide door hardware.

1.2 SUBMITTALS

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

B. Submit for approval hardware schedule proposed for use based on Owner's requirements.

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Hardware for Fire-Rated Openings: NFPA 80, and local requirements.

C. Materials and Application: ANSI A156 series standards.

PART 2 PRODUCTS

2.1 MATERIALS

A. Door Hardware:
1. Manufacturers:Hager Companies;Miller Edge, Inc.;ProdataKey;Reese Enterprises, Inc..
2. Quality Level: Commercial.
3. Locksets and Latchsets: Bored cylindrical type.
4. Lock Cylinders: Integral.
5. Lock Cylinders: Interchangeable.
6. Keying: Owner's requirements.
7. Hinges and Butts: Full-mortise type at interior, with nonremovable pins at exterior doors.
8. Closers, Door Control, and Exit Devices: High frequency.
9. Push/Pull Units: Through-bolted type.
10. Hardware Finishes: See hardware schedule
11. Auxiliary Materials:

a. Door Trim Units: Kickplates, edge trim, and related trim.
b. Stops and overhead door holders.
c. Soundstripping.
d. Weatherstripping and thresholds.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions and approved

submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

B. Adjust operation, clean and protect.

3.2 SCHEDULE

A. Hardware Schedule: See Architectural Drawings set.

END OF SECTION

SECTION 092900

GYPSUM BOARD

PART 1 GENERAL

1.1 SUMMARY

A. Provide gypsum board assemblies.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Tolerances: Not more than 1/16-inch difference in true plane at joints between adjacent boards before finishing. After finishing, joints shall be not be visible. Not more than 1/8 inch in 10 feet deviation from true plane, plumb, level and proper relation to adjacent surfaces in finished work.

PART 2 PRODUCTS

2.1 MATERIALS

A. Gypsum Board:
1. Manufacturers: Refer towww.arcat.com/divs/sec/sec09260.html
2. Application: Interior walls, partitions, and ceilings with tape and joint compound finish.
3. Application: Cementitious backer units for application of tile.
4. Material Standard: ASTM C1396.
5. Type: Water-resistant gypsum backing board.

a. Type: Regular:
b. Typical Thickness: 1/2 inch.

6. Joint Treatment: ASTM C474 and ASTM C840, 3-coat system, paper or fiberglass tape.
7. Auxiliary Materials:

a. Cornerbead, edge trim and control joints.
b. Gypsum board screws, ASTM C 1002.
c. Fastening adhesive.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install gypsum board for tape and 3-coat joint compound finish in compliance with ASTM C 840 and GA 216, Level 4 finish. Install gypsum board assemblies true, plumb, level and in proper relation to adjacent surfaces.

B. Provide fire-rated systems where indicated and where required by authorities having jurisdiction.

C. Install boards vertically. Do not allow butt-to-butt joints and joints that do not fall over framing members.

D. Where new partitions meet existing construction, remove existing cornerbeads to provide a smooth transition.

E. Provide insulation full height and thickness in partitions at conference rooms, toilet rooms, between different occupancies, and where required.

F. Install trim in strict compliance with manufacturer's instructions and recommendations.

G. Repair surface defects. Leave ready for finish painting or wall treatment.

END OF SECTION

SECTION 093013

CERAMIC TILING

PART 1 GENERAL

1.1 SUMMARY

A. Porcelain floor and wall tile.

B. Solid surface thresholds.

C. Tile backing panels.

D. Waterproof membrane for thinset applications.

E. Crack isolation membrane.

F. Metal edge strips.

1.2 SUBMITTALS

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

B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
1. Include manufacturers full range of color and finish options if additional selection is required.

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Tile: ANSI A 137.1.

C. Tile Setting Materials: ANSI A 118 series standard specifications.

D. Tile Installation: ANSI 108 series standard specifications and Tile Council of America, Handbook for Ceramic Tile Installation.

PART 2 PRODUCTS

2.1 MATERIALS

A. Tile:
1. Manufacturers: See Architectural Drawing Set for reference.
2. Application: Interior wall tile over gypsum wallboard.
3. Application: Interior wall tile over tile backer board at wet areas.
4. Application: Interior floor tile over concrete slab.
5. Type: See Architectural Drawing Set for reference.

B. Setting Materials:
1. Manufacturers: Custom Building Products;Futura Transitions;LATICRETE

International, Inc.;MAPEI;North American Adhesives;PROFLEX® Products, Inc.;Schluter Systems LP.

2. Mortar setting bed.

a. Latex additive.
   1. Thin-set mortar.

b. Latex-Portland cement mortar.
   1. Organic adhesive.
   2. Grout.

c. Latex-Portland cement grout.
   1. Crack suppression membrane under tile.

d. ANSI A 118.10.
   1. Elastomeric sealants.
   2. Solid Surface thresholds.

PART 3 EXECUTION

3.1 INSTALLATION

A. Comply with Tile Council of America and ANSI Standard Specifications for Installation for substrate and installation required. Comply with manufacturer's instructions and recommendations.

B. Install crack suppression membrane in accordance with manufacturer's instructions and recommendations.

C. Lay tile in grid pattern with alignment grids. Layout tile to provide uniform joint widths and to minimize cutting; do not use less than 1/2 tile units.

D. Provide sealant joints where recommended by TCA and approved by Architect.

E. Grout and cure, clean and protect.

3.2 SCHEDULE

A. Tile Schedule: See Architectural Drawing Set for reference.
   1. Toilet Room Walls: Glazed ceramic mosaic tile over tile backer board with thin-set latex-modified cement mortar and latex-Portland cement grout.
   2. Toilet Room Floors: Unglazed ceramic mosaic tile over concrete slab with latex-Portland cement mortar and latex-Portland cement grout.

END OF SECTION

SECTION 099123
INTERIOR PAINTING

PART 1 GENERAL

1.1 SUMMARY

A. Provide painting and surface preparation.

B. See Architectural drawings set for reference.

1.2 SUBMITTALS

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

B. Samples: Submit two representative samples of each material specified indicating visual characteristics and finish. Include range samples if variation of finish is anticipated.
   1. Include manufacturers full range of color and finish options if additional selection is required.

C. Extra Stock: Submit 2 unopened gallons of each paint and color used in the project.

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Regulations: Compliance with VOC and environmental regulations.

PART 2 PRODUCTS

2.1 MATERIALS

A. Painting:
   1. Manufacturers: Behr Paint Company; Benjamin Moore & Co. (Canada); Benjamin Moore & Co. (United States); Coronado Paint Co.; Dumond, Inc.; Florida Paints; Kelly-Moore Paints; PPG Architectural Finishes, Incorporated - PPG Paints; Sherwin-Williams.
   2. Application: Interior unfinished surfaces.
   3. Primary Coating Type: Latex based paints.
   4. Primary Coating Type: Zero VOC paints.
   5. Primary Paint Systems: Primer plus two finish coats.

PART 3 EXECUTION

3.1 INSTALLATION

A. Inspect surfaces, report unsatisfactory conditions in writing; beginning work means acceptance of substrate.

B. Comply with manufacturer's instructions and recommendations for preparation, priming and coating work. Coordinate with work of other sections.

C. At existing areas to be repainted, remove blistered or peeling paint to sound substrates.

Remove chalk deposits and mildew and wash all surfaces with mild detergent. Perform related minor preparation including caulk and glazing compounds. Spot prime bare areas before priming and painting as specified.

D. Match approved mock-ups for color, texture, and pattern. Re-coat or remove and replace work which does not match or shows loss of adhesion. Clean up, touch up and protectwork.

3.2 PAINT SCHEDULE

E. See Architectural Finish Plan

END OF SECTION

SECTION 102113.19
SOLID PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Solid plastic toilet compartments including the following:

1. Floor mounted overhead-braced toilet compartments.

2. Wall mounted urinal screens.

1.2 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry.

1.3 REFERENCES

A. ASTM International (ASTM):

1. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

2. ASTM B 85 - Standard Specification for Aluminum-Alloy Die Castings.

3. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

B. National Fire Protection Association (NFPA) 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Installation methods.

C. Shop Drawings: Provide layout drawings and installation details with location and type of hardware required.

D. Verification Samples: For each finish product specified, two samples representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A company regularly engaged in manufacture of products specified in this section, and whose products have been in satisfactory use under similar service conditions for not less than 5 years.

B. Installer Qualifications: A company regularly engaged in installation of products specified in this Section, with a minimum of 5 years experience.

C. Performance Requirements:

1. Fire Resistance: Partition materials shall comply with the following requirements, when tested in accordance with the ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials:

a. Class B flame spread/smoke developed rating, tested to ASTM E84.

2. Material Fire Ratings:

D. National Fire Protection Association (NFPA) 286: Pass.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

A. Manufacturer guarantees its plastic against breakage, corrosion, and delamination under normal conditions for 25 years from the date of receipt by the customer. If materials are found to be defective during that period for reasons listed above, the materials will be replaced free of charge. (Labor not included in warranty.)

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Scranton Products, which is located at: 801 E. Corey St.; Scranton, PA 18505; Toll Free Tel: 800-445-5148; Fax: 855-376-6161; Email:request info (info@scrantonproducts.com); Web:http://www.scrantonproducts.com

2.2 MATERIAL

A. Plastic Panels: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent, and graffiti-resistant textured surface.

1. Fire-resistance Rating: Tested in Accordance with NFPA 286.

2. Fire-resistance Rating: Tested to meet ASTM E84, Class B.

B. Aluminum Extrusions: ASTM B221, 6463-T5 alloy and temper.

C. Aluminum Die Castings: ASTM B85, A380 alloy.

D. Stainless Steel Castings: ASTM A167, Type 304.

E. Rubber: Abrasion resistant Styrene Butadiene Rubber, 65 to 80 Shore A durometer, black.

2.3 SOLID PLASTIC TOILET COMPARTMENTS AND SCREENS

A. Basis of Design: Eclipse Toilet Partitions as manufactured by and supplied by Scranton Products.

1. Style: Floor mounted overhead-braced toilet compartments.

B. Doors and Panels: High density polyethylene (HDPE), fabricated from SEQ CHAPTER 1extruded polymer resins, forming single thickness panel.

1. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.

2. Thickness: 1 inch (25 mm).

3. Edges: Shiplap.

C. Panel Color: Bold Series:

1. Blueberry - Orange Peel.

D. Doors and Dividing Panels:

1. Standard Privacy:

    a. Height: 55 inches (1397 mm) high and mounted at 14 inches (356 mm) above the finished floor.

E. Metal Posts: 82.75 inches (2102 mm) high, heavy duty extruded aluminum, clear anodized finish, fastened to foot with stainless steel tamper resistant screw.

F. Hidden Shoe (Foot): One-piece molded polyethylene invisible shoe inserted into metal post and secured to metal post with stainless steel tamper resistant screw.

G. Headrail Cap and Corner Cap: One-piece molded polyethylene secured to metal post with stainless steel tamper resistant screw; adjustable to level headrail to finished floor.

H. Wall Brackets: Continuous heavy duty extruded aluminum, clear anodized finish, inserted into slotted panel and fastened to panels with stainless steel tamper resistant screws.

1. Type: Double ear bracket aluminum.

2. Length: 54 inches (1372 mm).

I. Headrail: Heavy duty extruded aluminum, designer anti-grip design, clear anodized finish, fastened to headrail bracket with stainless steel tamper resistant screw and to headrail cap or corner cap with stainless steel tamper resistant screw.

1. Headrail Brackets: Heavy duty extruded aluminum, clear anodized finish, secured to wall with stainless steel tamper screws.

J. Door Hardware:

1. Hinges:

    a. Edge-mounted helix style stainless steel continuous hinge.

        1) Closing degree: 5 degrees.

        2) Comes to a full close on its own weight

2. Occupancy Indicator Latch and Housing:

    a. Material: Satin stainless steel.

    b. Occupancy indicators: Green for occupied and red not occupied.

    c. Slide bolt and button.

3. Coat Hook and Door Bumper Combination:

    a. Material: Chrome plated Zamak

    b. Handicap Door: Equip with second door pull and door stop.

4. Door Pulls: Chrome plated Zamak

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Examine areas to receive toilet partitions, screens, and shower compartments for correct height and spacing of anchorage/blocking and plumbing fixtures that affect installation of partitions. Report discrepancies to the architect.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved Shop Drawings.

B. Install partitions rigid, straight, plumb, and level.

C. Locate bottom edge of doors and panels 14 inches (356 mm) above finished floor.

D. Clearance at vertical edges of doors shall be uniform top to bottom and shall not exceed 3/8 inch (9.5 mm).

E. No evidence of cutting, drilling, and/or patching shall be visible on the finished work.

F. Finished surfaces shall be cleaned after installation and be left free of imperfections.

3.4 ADJUSTING

A. Adjust doors and latches to operate correctly.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 102600
DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 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 or comparable product by one of the following:

1. Advance Products & Systems, Inc.
2. Metraflex Company (The).

C. 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.

2.2 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi (), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in concrete and masonry walls; sleeves at wood construction and drywall penetrations are not required.

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 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 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE 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.

2. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6 (): Cast-iron wall sleeves with sleeve-seal system Galvanized-steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch () annular clear space between piping and sleeve for installing sleeve-seal system.

3. Interior Partitions:

a. Piping Smaller Than NPS 6 (): Galvanized-steel-pipe sleeves PVC-pipe sleeves.

END OF SECTION

SECTION 102800

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Provide toilet and bath accessories.

1.2 SUBMITTALS

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

B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 MATERIALS

A. ADA Compliant Toilet and Bath Accessories: See Architectural Drawings
1. Accessory: Toilet tissue dispensers.
2. Accessory: Grab bars – horizontal and vertical mounted.
3. Accessory: Sanitary napkin disposal units.
4. Accessory: Automatic Soap dispensers – counter and wall mounted.
5. Accessory: Seat cover dispensers.
6. Accessory: Adult care / Baby changing stations.
7. Accessory: Undercounter lavatory pipe guards.
8. Accessory: Electric hand dryers.
9. Accessory: Mirror and frames.
10. Accessory: Paper towel dispenser and waste receptacle – surface mounted.
11. Accessory: Door hook hangers.
12. Finish: See architectural drawings

PART 3 EXECUTION

3.1 INSTALLATION

A. Install materials and systems in accordancewith manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

B. Restore damaged finishes and test for proper operation. Clean and protect work from damage.

END OF SECTION

SECTION 220517
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 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 or comparable product by one of the following:

1. Advance Products & Systems, Inc.
2. Metraflex Company (The).

C. 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.

2.2 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi (), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in concrete and masonry walls; sleeves at wood construction and drywall penetrations are not required.

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 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 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE 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.
2. Concrete Slabs-on-Grade:
    a. Piping Smaller Than NPS 6 (): Cast-iron wall sleeves with sleeve-seal system Galvanized-steel-pipe sleeves with sleeve-seal system.
        1) Select sleeve size to allow for 1-inch () annular clear space between piping and sleeve for installing sleeve-seal system.
3. Interior Partitions:
    a. Piping Smaller Than NPS 6 (): Galvanized-steel-pipe sleeves PVC-pipe sleeves.

END OF SECTION

SECTION 220518

ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Escutcheons.

2. Floor plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS (For Use where visible in Finished Spaces)

A. Description: manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube and insulation of insulated piping and an OD that completely covers opening;

PART 3 - Finish: chrome-plated.EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.

c. Insulated Piping: One-piece, stamped-steel type.

d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.

f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.

C. 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.

PART 4 - GENERAL

4.1 SUMMARY

A. Section Includes:

1. Escutcheons.

2. Floor plates.

4.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 5 - PRODUCTS

5.1 ESCUTCHEONS (For Use where visible in Finished Spaces)

A. Description: manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube and insulation of insulated piping and an OD that completely covers opening;

PART 6 - Finish: chrome-plated.EXECUTION

6.1 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 type with polished, chrome-plated finish.

c. Insulated Piping: One-piece, stamped-steel type.

d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.

f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.

C. 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.

END OF SECTION

SECTION 220523

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.
3. Iron, single-flange butterfly valves.
4. Bronze swing check valves.
5. Iron swing check valves.
6. Bronze gate valves.
7. Iron gate valves.

B. Related Sections:

1. Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
2. Section 221116 "Domestic Water Piping" for valves applicable only to this piping.
3. Section 221319 "Sanitary Waste Piping Specialties" for valves applicable only to this piping.

1.2 ACTION 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.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Handwheel: For valves other than quarter-turn types.
2. Handlever: For quarter-turn valves NPS 6 () and smaller except plug valves.

E. Valves in Insulated Piping: With 2-inch () stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

F. 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. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Hammond Valve.
   b. Milwaukee Valve Company.
   c. NIBCO INC.
2. Description:
   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig ().
   c. CWP Rating: 600 psig ().
   d. Body Design: Two piece.
   e. Body Material: Forged brass.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Brass.
   i. Ball: Chrome-plated brass.
   j. Port: Full.

2.3 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Hammond Valve.
   b. Milwaukee Valve Company.
   c. NIBCO INC.
2. Description:
   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig ().
   c. CWP Rating: 600 psig ().
   d. Body Design: Two piece.
   e. Body Material: Bronze.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Bronze.
   i. Ball: Chrome-plated brass.

j. Port: Full.

2.4 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.

b. Hammond Valve.

c. Milwaukee Valve Company.

d. NIBCO INC.

e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.

b. CWP Rating: 200 psig ().

c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.

d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.

e. Seat: EPDM.

f. Stem: One- or two-piece stainless steel.

g. Disc: Aluminum bronze.

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. Hammond Valve.

b. Milwaukee Valve Company.

c. NIBCO INC.

d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 3.

b. CWP Rating: 200 psig ().

c. Body Design: Horizontal flow.

d. Body Material: ASTM B 62, bronze.

e. Ends: Threaded.

f. Disc: Bronze.

2.6 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hammond Valve.

b. Milwaukee Valve Company.

c. NIBCO INC.

d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-71, Type I.

b. CWP Rating: 200 psig ().

c. Body Design: Clear or full waterway.

d. Body Material: ASTM A 126, gray iron with bolted bonnet.

e. Ends: Flanged.

f. Trim: Bronze.

g. Gasket: Asbestos free.

2.7 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. Hammond Valve.

b. Milwaukee Valve Company.

c. NIBCO INC.

d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 1.

b. CWP Rating: 200 psig ().

c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.

d. Ends: Threaded or solder joint.

e. Stem: Bronze.

f. Disc: Solid wedge; bronze.

g. Packing: Asbestos free.

h. Handwheel: Malleable iron.

2.8 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. Hammond Valve.

b. Milwaukee Valve Company.

c. NIBCO INC.

d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

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. Hammond Valve.

b. Milwaukee Valve Company.

c. NIBCO INC.

d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

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.

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.

D. Install valves in position to allow full stem movement.

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 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 () and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.

2. Ball Valves: Two piece, full port, brass bronze with brass bronze trim.

3. Bronze Swing Check Valves: Class 125, bronze disc.

4. Bronze Gate Valves: Class 125, NRS.

B. Pipe NPS 2-1/2 () and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.
3. Iron Swing Check Valves: Class 125, metal seats.
4. Iron Gate Valves: Class 125, NRS OS&Y.

END OF SECTION

SECTION 220529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe positioning systems.
6. Equipment supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Equipment supports.Paragraph below is defined in Section 013300 "Submittal Procedures" as a "Delegated-Design Submittal." Retain if Work of this Section is required to withstand specific design loads and design responsibilities have been delegated to Contractor or if structural data are required as another way to verify compliance with performance requirements. Professional engineer qualifications are specified in Section 014000 "Quality Requirements."

1.3 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.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

1.4 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.

1.5 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig () minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig () minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches () beyond sheet metal shield for piping operating below ambient air temperature.

1.6 FASTENER SYSTEMS

A. 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.

1.7 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.

1.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

1.9 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.

1. Properties: Nonstaining, noncorrosive, and nongaseous.

2. Design Mix: 5000-psi (), 28-day compressive strength.

PART 2 - EXECUTION

2.1 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. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 () and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.
    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
2. 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.

2.2 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.

2.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers 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.

2.4 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 ().

2.5 PAINTING

A. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

2.6 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 metal trapeze pipe hangers 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. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 ().

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 ().

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.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

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. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

P. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

SECTION 220553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.2 ACTION SUBMITTAL

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch () Aluminum, 0.032-inch () minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch ().
3. Minimum Letter Size: 1/4 inch () for name of units if viewing distance is less than 24 inches (), 1/2 inch () for viewing distances up to 72 inches (), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch () bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch () thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F ().

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch ().

F. Minimum Letter Size: 1/4 inch () for name of units if viewing distance is less than 24 inches (), 1/2 inch () for viewing distances up to 72 inches (), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

2. Lettering Size: At least 1-1/2 inches () high.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet () along each run. Reduce intervals to 25 feet () in areas of congested piping and equipment.

7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

END OF SECTION

SECTION 220719

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Piping shall be insulated as required by local code or as required by authority having jurisdiction.

B. 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. Supplies and drains for handicap-accessible lavatories and sinks.

C. Related Sections:

1. Section 220716 "Plumbing Equipment Insulation."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 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 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.

B. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. factory-applied jacket requirements are specified in "Factory Applied Jackets" Article.

1. Products: subject to compliance with requirements, shall be by the following manufacturers and model or approved equal:
    a. Pittsburgh Corning Corperation: Foamglass
    b. K-Flex USA: Insul-Lock DS.
2. Block Insulation: ASTM C 552, Type I.
3. Special- Shaped Insulation: ASTM C 552, Type III
4. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
5. Preformed Pipe Insulation with Factory Applied ASJ, and ASJ-SSL: Comply with ASTM 552, Type II, Class 2.
6. Factory fabricated shapes according to ASTM C 450 and ASTM C 585.

2.2 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.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of 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.
4. Cleanouts.

3.3 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.

3.4 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulations 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 langitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

3. For installation with factory applied jackets on above ambient services, do not staple longitudinal tabs. instead, secure tabs with additional adhesive as recommended by the 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 the 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 the 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 the same material and 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 materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insullation to valve body.

2. Arrange insulation to permit access to packing and to allow vlave operation without disturbing insulation.

3. Install insulation to flanges as specified flange insulation application.

3.5 FINISHES

A. Insulation with ASJ, ASJ-SSL, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. 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.

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

3.7 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.

3.8 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot and Recirculated Hot Water: Insulation shall be one of the following:

1. Flexible Elastomeric: 3/4 inch () thick.

2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch () thick.

B. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities: Insulation shall be one of the following:

1. Flexible Elastomeric: 1/2 inch () thick.

2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch () thick.

3.9 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. PVC: 20 mils () thick.

D. Piping, Exposed:

1. PVC: 20 mils () thick.

END OF SECTION

SECTION 221116

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

1.2 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.3 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

A. CPVC Tubing System: ASTM D 2846/D 2846M, SDR 11, tube and socket fittings.

2.3 PVC PIPE AND FITTINGS

A. PVC Pipe: ASTM D 1785, Schedule 40.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch () thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.

2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

F. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

G. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install domestic water piping level with 0.25 percent slope downward toward drainand plumb.

G. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

H. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

I. 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.

J. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

K. Install piping to permit valve servicing.

L. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

M. Install piping free of sags and bends.

N. Install fittings for changes in direction and branch connections.

O. Install PEX piping with loop at each change of direction of more than 90 degrees.

P. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

Q. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."

R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

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

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

D. Joint Construction for Solvent-Cemented Plastic Piping: 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. Apply primer.

2. PVC Piping: Join according to ASTM D 2855.

E. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.

2. Individual, Straight, Horizontal Piping Runs:

a. 100 Feet () and Less: MSS Type 1, adjustable, steel clevis hangers.

b. Longer Than 100 Feet (): MSS Type 43, adjustable roller hangers.

c. Longer Than 100 Feet () if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet () or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch ().

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 () and Smaller: 60 inches () with 3/8-inch () rod.

2. NPS 1 and NPS 1-1/4 (): 72 inches () with 3/8-inch () rod.

3. NPS 1-1/2 and NPS 2 (): 96 inches () with 3/8-inch () rod.

4. NPS 2-1/2 (): 108 inches () with 1/2-inch () rod.

5. NPS 3 to NPS 5: 10 feet () with 1/2-inch () rod.

E. Install supports for vertical copper tubing every 10 feet ().

F. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 () and Smaller: 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 and NPS 3-1/2 (): 12 feet () with 1/2-inch () rod.

6. NPS 4 and NPS 5 (): 12 feet () with 5/8-inch () rod.

G. Install supports for vertical steel piping every 15 feet ().

H. Install vinyl-coated hangers for CPVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1 () and Smaller: 36 inches () with 3/8-inch () rod.
2. NPS 1-1/4 to NPS 2: 48 inches () with 3/8-inch () rod.
3. NPS 2-1/2 to NPS 3-1/2: 48 inches () with 1/2-inch () rod.
4. NPS 4 and NPS 5 (): 48 inches () with 5/8-inch () rod.

I. Install supports for vertical CPVC piping every 60 inches () for NPS 1 () and smaller, and every 72 inches () for NPS 1-1/4 () and larger.

J. Install vinyl-coated hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 2 () and Smaller: 48 inches () with 3/8-inch () rod.
2. NPS 2-1/2 to NPS 3-1/2: 48 inches () with 1/2-inch () rod.
3. NPS 4 and NPS 5 (): 48 inches () with 5/8-inch () rod.

K. Install supports for vertical PVC piping every 48 inches ().

L. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.

3.6 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.7 PIPING SCHEDULE

A. Aboveground domestic water piping, NPS 2 () and smaller , shall be one of the following:

1. CPVC, Schedule 40 ; socket fittings; and solvent-cemented joints.
2. CPVC Tubing System: CPVC tube; CPVC socket fittings; and solvent-cemented joints.
3. PEX tube, NPS 1 () and smaller; fittings for PEX tube; and crimped joints.
4. PVC, Schedule 40; socket fittings; and solvent-cemented joints.
5. CPVC, Schedule 40 ; socket fittings; and solvent-cemented joints.
6. PVC, Schedule 40; socket fittings; and solvent-cemented joints.

B. Aboveground, combined domestic water-service and fire-service-main piping, NPS 4 to NPS 12, shall be the following:

1. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.

END OF SECTION

SECTION 221119

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backflow preventers.
2. Water pressure-reducing valves.
3. Temperature-actuated, water mixing valves.
4. Strainers.
5. Wall hydrants.
6. Water-hammer arresters.
7. Trap-seal primer valves.

B. Related Requirements:

1. Section 220519 "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
2. Section 221116 "Domestic Water Piping" for water meters.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61.

2.2 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers Insert drawing designation if any:

1. Standard: ASSE 1013.
2. Operation: Continuous-pressure applications.
3. Pressure Loss: 12 psig () maximum, through middle third of flow range.
4. Size: .
5. Design Flow Rate: .
6. Selected Unit Flow Range Limits: .
7. Pressure Loss at Design Flow Rate: for sizes NPS 2 () and smaller; for NPS 2-1/2 () and larger.
8. Body: Bronze for NPS 2 () and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 () and larger.
9. End Connections: Threaded for NPS 2 () and smaller; for NPS 2-1/2 () and larger.
10. Configuration: Designed for horizontal, straight-through flow.
11. Accessories:

a. Valves NPS 2 () and Smaller: Ball type with threaded ends on inlet and outlet.

b. Valves NPS 2-1/2 () and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.

c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.3 WATER PRESSURE-REDUCING VALVES

A. Water Regulators :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.

b. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.

2. Standard: ASSE 1003.

3. Pressure Rating: Initial working pressure of 150 psig ().

4. Body: Bronze for NPS 2 () and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3 ().

5. End Connections: Threaded for NPS 2 () and smaller; flanged for NPS 2-1/2 and NPS 3 ().

2.4 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Powers; a division of Watts Water Technologies, Inc.

b. Symmons Industries, Inc.

c. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.

d. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.

2. Standard: ASSE 1017.

3. Pressure Rating: 125 psig ().

4. Type: Thermostatically controlled, water mixing valve.

5. Material: Bronze body with corrosion-resistant interior components.

6. Connections: Threaded union inlets and outlet.

7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.

8. Valve Finish: Chrome plated.

B. Primary, Thermostatic, Water Mixing Valves :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

2. Standard: ASSE 1017.

3. Pressure Rating: 125 psig ()minimum unless otherwise indicated.

4. Type: Exposed-mounted, thermostatically controlled, water mixing valve.

5. Material: Bronze body with corrosion-resistant interior components.

6. Connections: Threaded union inlets and outlet.

7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.

8. Valve Finish: Chrome plated.

9. Piping Finish: Chrome plated.

2.5 WALL HYDRANTS

A. Nonfreeze Wall Hydrants :

1. Standard: ASME A112.21.3M for exposed-outlet, self-draining wall hydrants.
2. Pressure Rating: 125 psig ().
3. Operation: Loose key.
4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
5. Inlet: NPS 3/4 or NPS 1 ().
6. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Polished nickel bronze.
9. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Polished nickel bronze.
11. Operating Keys(s): Two with each wall hydrant.

2.6 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Josam Company.
   b. Sioux Chief Manufacturing Company, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Watts Drainage Products.
   e. Zurn Industries, LLC; Plumbing Products Group; Specification Drainage Products.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.7 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   b. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig () minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 () threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 () threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.

2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.

3. Do not install bypass piping around backflow preventers.

B. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.

C. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

D. Install Y-pattern strainers for water on supply side of each control valve water pressure-reducing valve .

E. Install water-hammer arresters in water piping according to PDI-WH 201.

F. 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.

3.2 CONNECTIONS

A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.3 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION

SECTION 221316

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.

2. Specialty pipe fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Fernco Inc.

b. MIFAB, Inc.

c. Tyler Pipe.

2.3 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

C. Adhesive Primer: ASTM F 656.

D. Solvent Cement: ASTM D 2564.

2.4 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.

2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

3. Unshielded, Nonpressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Fernco Inc.

2) Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

b. Standard: ASTM C 1173.

c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

d. Sleeve Materials:

1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.

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.

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. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

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 at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

I. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

J. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Drain: 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. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.

3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

K. 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."

L. Install aboveground PVC piping according to ASTM D 2665.

M. Install underground PVC piping according to ASTM D 2321.

N. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."

2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."

O. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. 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.

B. 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.

C. 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. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.

2. In Drainage Piping: Unshielded, nonpressure transition couplings.

3.5 HANGER AND SUPPORT INSTALLATION

A. 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 carbon-steel pipe support clamps for vertical piping in noncorrosive environments.

3. Vertical Piping: MSS Type 8 or Type 42, clamps.

4. 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.

5. Multiple, Straight, Horizontal Piping Runs 100 Feet () or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

6. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches () of each fitting, valve, and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch () minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (): 60 inches () with 3/8-inch () rod.

2. NPS 3 (): 60 inches () with 1/2-inch () rod.

3. NPS 4 and NPS 5 (): 60 inches () with 5/8-inch () rod.

4. NPS 6 and NPS 8 (): 60 inches () with 3/4-inch () rod.

5. Spacing for 10-foot () lengths may be increased to 10 feet (). Spacing for fittings is limited to 60 inches ().

F. Install supports for vertical cast-iron soil piping every 15 feet ().

G. Install hangers for 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.

H. Install supports for vertical PVC piping every 48 inches ().

I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.

2. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.

3. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.

4. Comply with requirements for cleanouts drains specified in Section 221319 "Sanitary Waste Piping Specialties."

5. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 () and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 () and smaller, adjacent to each valve and at final connection to each piece of equipment.

2. Install flanges, in piping NPS 2-1/2 () and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

6. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.10 PIPING SCHEDULE

A. Aboveground, soil and waste piping NPS 4 () and smaller shall be any of the following:

1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.

2. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

3. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

B. Aboveground, soil and waste piping NPS 5 () and larger shall be any of the following:

1. PVC pipe, PVC socket fittings, and solvent-cemented joints.

2. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

C. Aboveground, vent piping NPS 4 () and smaller shall be any of the following:

1. PVC pipe, PVC socket fittings, and solvent-cemented joints.

D. Underground, soil, waste, gray water, and vent piping NPS 4 () and smaller shall be any of the following:

1. PVC pipe, PVC socket fittings, and solvent-cemented joints.

E. Underground, soil, waste and gray water piping NPS 5 () and larger shall be any of the following:

1. PVC pipe; PVC socket fittings; and solvent-cemented joints.

END OF SECTION

SECTION 221319

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cleanouts.
2. Floor drains.
3. Roof flashing assemblies.
4. Miscellaneous sanitary drainage piping specialties.
5. Flashing materials.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Cast-Iron Cleanouts :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Josam Company.
   b. Smith, Jay R. Mfg. Co.
   c. Watts Drainage Products.
   d. Zurn Plumbing Products Group.
2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, brass plastic plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Floor Cleanouts :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Watts Drainage Products Inc.
   d. Zurn Plumbing Products Group; Light Commercial Operation.
   e. Zurn Plumbing Products Group; Specification Drainage Operation.
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.
6. Clamping Device: Required.
7. Outlet Connection: Inside calk Spigot Threaded.
8. Closure: Brass plug with straight threads and gasket Cast-iron plug Plastic plug.
9. Adjustable Housing Material: Cast iron Plastic with threads set-screws or other device.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy Polished bronze Rough bronze.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Medium Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Watts Drainage Products Inc.
   d. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, drilled-and-threaded brass cast-iron plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, deep, chrome-plated bronze cover plate with screw.
8. Wall Access: Round, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Watts Drainage Products Inc.
   d. Zurn Plumbing Products Group; Specification Drainage Operation.
   e. .
2. Standard: ASME A112.6.3.
3. Pattern: Floor Funnel floor Sanitary drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.

8. Outlet: Bottom.
9. Backwater Valve: Not required.
10. Coating on Interior and Exposed Exterior Surfaces: Not required.
11. Sediment Bucket: Not required.
12. Top or Strainer Material: Bronze Nickel bronze.
13. Top of Body and Strainer Finish: Nickel bronze Polished bronze.
14. Top Shape: Round.
15. Dimensions of Top or Strainer:
16. Top Loading Classification: Medium Duty.
17. Funnel: Not required.
18. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
19. Trap Material: Cast iron.
20. Trap Pattern: Deep-seal P-trap Standard P-trap.
21. Trap Features: Trap-seal primer valve drain connection.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Acorn Engineering Company; Elmdor/Stoneman Div.
   b. Thaler Metal Industries Ltd.
2. Description: Manufactured assembly made of 4.0-lb/sq. ft. (), 0.0625-inch- () thick, lead flashing collar and skirt extending at least 6 inches () from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
   a. Open-Top Vent Cap: Without cap.
   b. Low-Silhouette Vent Cap: With vandal-proof vent cap.
   c. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains :

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Deep-Seal Traps :

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.
   a. NPS 2 (): 4-inch- () minimum water seal.
   b. NPS 2-1/2 () and Larger: 5-inch- () minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings :

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 () side inlet.

D. Air-Gap Fittings :

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

E. Sleeve Flashing Device :

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch () above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

F. Stack Flashing Fittings :

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

G. Vent Caps :

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

2.5 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft. (), 0.0625-inch () thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft. (), 0.0469-inch () thickness.
3. Burning: 6-lb/sq. ft. (), 0.0938-inch () thickness.

B. Fasteners: Metal compatible with material and substrate being fastened.

C. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

D. Solder: ASTM B 32, lead-free alloy.

E. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (). Use NPS 4 () for larger drainage piping unless larger cleanout is indicated.

2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet () for piping NPS 4 () and smaller and 100 feet () for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

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

E. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

F. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

G. Assemble open drain fittings and install with top of hub 1 inch () 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 flashing device with each riser and stack passing through floors with waterproof membrane.

L. Install vent caps on each vent pipe passing through roof.

M. 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.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft. (), 0.0938-inch () thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft. (), 0.0625-inch () thickness or thinner.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (), and skirt or flange extending at least 8 inches () around pipe.

2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches () around sleeve.

3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches () around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076200 "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each grease interceptor.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 221319.13
SANITARY DRAINS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Floor drains.
2. Trench drains.

1.2 DEFINITIONS

A. ABS: Acrylonitrile-butadiene styrene.

B. FRP: Fiberglass-reinforced plastic.

C. HDPE: High-density polyethylene.

D. PE: Polyethylene.

E. PP: Polypropylene.

F. PVC: Polyvinyl chloride.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 PRODUCTS

2.1 FLOOR DRAINS

A. Cast-Iron Floor Drains <>:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Josam Company.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.
   d. Tyler Pipe; a subsidiary of McWane Inc.
   e. Zurn Industries, LLC.
2. Pattern: Area drain.
3. Body Material: Gray iron.
4. Seepage Flange: Required.
5. Anchor Flange: Required.
6. Clamping Device: Not required.
7. Outlet: Bottom.
8. Backwater Valve: Drain-outlet type.
9. Coating on Interior and Exposed Exterior Surfaces: Not required.
10. Top or Strainer Material: Gray iron.
11. Top of Body and Strainer Finish: Rough bronze.
12. Top Shape: Round.
13. Top Loading Classification: Medium Duty.

14. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
15. Trap Material: Cast iron.
16. Trap Pattern: Deep-seal P-trap.
17. Trap Features: Cleanout and trap-seal primer valve drain connection.

2.2 TRENCH DRAINS

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    a) Josam Company.
    b) MIFAB, Inc.
    c) Smith, Jay R. Mfg. Co.
    d) Tyler Pipe; a subsidiary of McWane Inc.
    e) Watts; a Watts Water Technologies company.
    f) Zurn Industries, LLC.
    2) Standard: ASME A112.6.3 for trench drains.
2. Material: Ductile or gray iron.
3. Flange: Seepage.
4. Clamping Device: Required.
5. Outlet: End.
6. Grate Material: Ductile iron or gray iron .
7. Grate Finish: Painted .
8. Top Loading Classification: Medium Duty.
9. Trap Material: Cast iron.
10. Trap Pattern: Standard P-trap.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.
3. Set with grates depressed according to the following drainage area radii:
    a. Radius, 30 Inches ()or Less: Equivalent to 1 percent slope, but not less than ()total depression.
    b. Radius, 30 to 60 Inches (): Equivalent to 1 percent slope.
    c. Radius, 60 Inches ()or Larger: Equivalent to 1 percent slope, but not greater than ()total depression.
4. Install floor-drain flashing collar or flange, so no leakage occurs between drain and adjoining flooring.
    a. Maintain integrity of waterproof membranes where penetrated.
5. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

B. Install trench drains at low points of surface areas to be drained.

1. Set grates of drains flush with finished surface, unless otherwise indicated.

2. Install on support devices, so that top will be flush with adjacent surface.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Comply with requirements in Section 221319 "Sanitary Waste Piping Specialties" for backwater valves, air admittance devices and miscellaneous sanitary drainage piping specialties.

C. Comply with requirements in Section 221323 "Sanitary Waste Interceptors" for grease interceptors, grease-removal devices, oil interceptors, sand interceptors, and solid interceptors.

D. Install piping adjacent to equipment to allow service and maintenance.

E. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

F. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 224100

PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: See Construction Drawings for "Plumbing Fixture Schedule" indicating the Basis-of-Design Fixtures.

1. Supply fittings.

2. Waste fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted plumbing fixtures.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 (SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Lavatory Kitchen Sink Supply Fittings:

1. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.

2. Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.

a. Operation: Wheel handle.

3. Risers:

a. Size: NPS 3/8 () for lavatories.

b. Size: NPS 3/8 () for kitchen sinks .

c. Material: Chrome-plated, soft-copper flexible tube ASME A112.18.6, braided- or corrugated-stainless-steel flexible hose riser.

2.2 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 () offset tailpiece for accessible lavatories.

C. Drain: Pop-up type with NPS 1-1/4 () straight tailpiece as part of faucet for standard lavatories.

D. Drain: Grid type with NPS 1-1/2 () offset tailpiece for accessible kitchen sinks.

E. Drain: Grid type with NPS 1-1/2 () straight tailpiece for standard kitchen sinks.

F. Trap:

1. Size: NPS 1-1/4 () for lavatories.

2. Size: NPS 1-1/2 () for kitchen sinks.

3. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- () thick brass tube to wall ; and chrome-plated-brass or -steel wall flange.

4. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch- () thick stainless-steel tube to wall; and stainless-steel wall flange.

5. Material: ASTM F 409 PVC two-piece trap and waste to wall and wall flange.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi (), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install plumbing fixtures level and plumb according to roughing-in drawings.

B. Install floor-mounted water closets on closet flange attachments to drainage piping.

C. Install counter-mounting fixtures in and attached to casework.

D. Install 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 Section 220523 "General-Duty Valves for Plumbing Piping."

E. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

F. Install toilet seats on water closets.

G. 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.

H. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.

2. Exception: Omit trap on indirect wastes unless otherwise indicated.

I. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks.

J. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

K. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

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 Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks.

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

SECTION 230513
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet () above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

E. Temperature Rise: Match insulation rating.

F. Insulation: Class F.

G. Code Letter Designation:

1. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

2.4 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 230593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.

B. Contractor shall reference the Energy Star Version 3 HVAC Requirements in addition to this specification.

1.2 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.3 INFORMATIONAL SUBMITTALS

A. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

B. Certified TAB reports.

1.4 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC .

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC or .

2. TAB Technician: Employee of the TAB contractor and who is certified by AABC as a TAB technician.

B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.

2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard TAB contractor's forms approved by Architect .

D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

F. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 233113 "Metal Ducts" Section 233116 "Nonmetal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.

2. Automatic temperature-control systems are operational.

3. Equipment and duct access doors are securely closed.

4. Balance, smoke, and fire dampers are open.

5. Isolating and balancing valves are open and control valves are operational.

6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.

7. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" and in this Section.

1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.

2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.

b. Measure static pressure directly at the fan outlet or through the flexible connection.

c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.

d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.

5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.

6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.

7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.

3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.

2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.

2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.7 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.8 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.

3.9 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare weekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.10 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.

B. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Duct, outlet, and inlet sizes.
3. Terminal units.
4. Balancing stations.
5. Position of balancing devices.

3.11 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

SECTION 230713

DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. All Ductwork within building envelope shall not be insulated. Any ductwork installed outside the building envelope (i.e.: attic space) shall be insulated per schedule on sheet M2.

B. All return air ductwork shall be sound lined from the return air grill back to the unit.

C. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.

D. Related Sections:

1. Section 230716 "HVAC Equipment Insulation."
2. Section 233113 "Metal Ducts" for duct liners.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 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 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.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, . Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 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. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.

3. Vinyl Jacket: White vinyl with a permeance of 1.3 perms () when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.3 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

2.4 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.

b. Compac Corporation; 110 and 111.

2. Width: 3 inches ().

3. Thickness: 6.5 mils ().

4. Adhesion: 90 ounces force/inch () in width.

5. Elongation: 2 percent.

6. Tensile Strength: 40 lbf/inch () in width.

7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.

b. Compac Corporation; 120.

2. Width: 2 inches ().

3. Thickness: 3.7 mils ().

4. Adhesion: 100 ounces force/inch () in width.

5. Elongation: 5 percent.

6. Tensile Strength: 34 lbf/inch () in width.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

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

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.

2. Cover circumferential joints with 3-inch- () wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches () o.c.

3. Overlap jacket longitudinal seams at least 1-1/2 inches (). Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 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 duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches () beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: (Coordinate with Roofing Contractor)

1. 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.

2. Extend jacket of outdoor insulation outside roof flashing at least 2 inches () below top of roof flashing.

3. Seal jacket to roof flashing with flashing sealant.

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

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

1. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches () from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch () outward-clinching staples, 1 inch () o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

2. Overlap unfaced blankets a minimum of 2 inches () on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches () o.c.

3. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

4. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- () wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches () o.c.

3.5 FIELD-APPLIED JACKET INSTALLATION

A. 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.

B. Where PVC jackets are indicated, install with 1-inch () overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. 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.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

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

3.7 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.8 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches () thick and 0.75-lb/cu. ft. () nominal density.

B. Concealed, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches () thick and 0.75-lb/cu. ft. () nominal density.

C. Exposed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches () thick and 0.75-lb/cu. ft. () nominal density.

D. Exposed, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches () thick and 0.75-lb/cu. ft. () nominal density.

END OF SECTION

SECTION 230800

COMMISSIONING OF HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes commissioning process requirements for HVAC&R systems, assemblies, and equipment.

B. Related Sections:

1. Section 019113 "General Commissioning Requirements" for general commissioning process requirements.

C. Contractor shall reference the Energy Star Version 3 HVAC Requirements in addition to this specification.

1.2 DEFINITIONS

A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

B. CxA: Commissioning Authority.

C. HVAC&R: Heating, Ventilating, Air Conditioning, and Refrigeration.

D. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.3 INFORMATIONAL SUBMITTALS

A. Certificates of readiness.

B. Certificates of completion of installation, prestart, and startup activities.

1.4 ALLOWANCES

A. Labor, instrumentation, tools, and equipment costs for technicians for the performance of commissioning testing are covered by the "Schedule of Allowances" Article in Section 012100 "Allowances."

1.5 UNIT PRICES

A. Commissioning testing allowance may be adjusted up or down by the "List of Unit Prices" Article in Section 012200 "Unit Prices" when actual man-hours are computed at the end of commissioning testing.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. Perform commissioning tests at the direction of the CxA.

B. Attend construction phase controls coordination meeting.

C. Attend testing, adjusting, and balancing review and coordination meeting.

D. Participate in HVAC&R systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.

E. Provide information requested by the CxA for final commissioning documentation.

F. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

1.7 CxA'S RESPONSIBILITIES

A. Provide Project-specific construction checklists and commissioning process test procedures for actual HVAC&R systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.

B. Direct commissioning testing.

C. Verify testing, adjusting, and balancing of Work are complete.

D. Provide test data, inspection reports, and certificates in Systems Manual.

1.8 COMMISSIONING DOCUMENTATION

A. Provide the following information to the CxA for inclusion in the commissioning plan:

1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.

2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.

3. Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for HVAC&R systems, assemblies, equipment, and components to be verified and tested.

4. Certificate of readiness, signed by the Contractor, certifying that HVAC&R systems, assemblies, equipment, components, and associated controls are ready for testing.

5. Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.

6. Certificate of readiness certifying that HVAC&R systems, subsystems, equipment, and associated controls are ready for testing.

7. Test and inspection reports and certificates.

8. Corrective action documents.

9. Verification of testing, adjusting, and balancing reports.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TESTING PREPARATION

A. Certify that HVAC&R systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify that HVAC&R instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

D. Inspect and verify the position of each device and interlock identified on checklists.

E. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

F. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.2 Testing AND BALANCING VERIFICATION

A. Prior to performance of testing and balancing Work, provide copies of reports, sample forms, checklists, and certificates to the CxA.

B. Notify the CxA at least 10 days in advance of testing and balancing Work, and provide access for the CxA to witness testing and balancing Work.

C. Provide technicians, instrumentation, and tools to verify testing and balancing of HVAC&R systems at the direction of the CxA.

1. The CxA will notify testing and balancing Contractor days in advance of the date of field verification. Notice will not include data points to be verified.

2. The testing and balancing Contractor shall use the same instruments (by model and serial number) that were used when original data were collected.

3. Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final testing, adjusting, and balancing report. For sound pressure readings, a deviation of 3 dB shall result in rejection of final testing. Variations in background noise must be considered.

4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.3 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

B. Scope of HVAC&R testing shall include entire HVAC&R installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing shall include measuring capacities and effectiveness of operational and control functions.

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The CxA along with the HVAC&R Contractor, testing and balancing Contractor, and HVAC&R Instrumentation and Control Contractor shall prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The CxA may direct that set points be altered when simulating conditions is not practical.

H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. If tests cannot be completed because of a deficiency outside the scope of the HVAC&R system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.4 hvac&R systems, subsystems, and equipment Testing Procedures

A. HVAC&R Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Section 230900 "Instrumentation and Control for HVAC" and Section 230993 "Sequence and Operations for HVAC Controls." Assist the CxA with preparation of testing plans.

B. Refrigeration System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of chillers, cooling towers, refrigerant compressors and condensers, heat pumps, and other refrigeration systems. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.

C. HVAC&R Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of air, steam, and hydronic distribution systems; special exhaust; and other distribution systems, including HVAC&R terminal equipment and unitary equipment.

END OF SECTION

SECTION 232300
REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop based on manufacturer's test data.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

1.5 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 VALVES AND SPECIALTIES

A. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig ().

B. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 deg F ().
6. Superheat: Adjustable.
7. End Connections: Socket, flare, or threaded union.
8. Working Pressure Rating: 450 psig () .

2.2 REFRIGERANTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.

PART 3 - EXECUTION

3.1 VALVE AND SPECIALTY APPLICATIONS

A. Install service valves for gage taps at strainers if they are not an integral part of strainers.

B. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.

2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.

3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

C. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Refer to Section 230900 "Instrumentation and Control for HVAC" and Section 230993 "Sequence and Operations for HVAC Controls" control wiring, and sequence of operation.

J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection.

L. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.

2. Install traps and double risers to entrain oil in vertical runs.

3. Liquid lines may be installed level.

M. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

N. 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."

O. 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."

P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 PIPE JOINT CONSTRUCTION

A. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.

2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Support multifloor vertical runs at least at each floor.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.

2. Test refrigerant piping and specialties. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.

3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

a. Fill system with nitrogen to the required test pressure.

b. System shall maintain test pressure at the manifold gage throughout duration of test.

c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.

d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.6 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers (). If vacuum holds for 12 hours, system is ready for charging.

2. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig ().

3.7 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Verify that compressor oil level is correct.

2. Open compressor suction and discharge valves.

3. Open refrigerant valves.

4. Check open compressor-motor alignment and verify lubrication for motors and bearings.

END OF SECTION

SECTION 233113

METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233116 "Nonmetal Ducts" for fibrous-glass ducts.
3. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 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 supportsshall withstand the effects of gravityloads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

1.4 QUALITY ASSURANCE

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

PART 2 - PRODUCTS

2.1 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 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.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

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 ().

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg (), positive and negative.
8. Service: Indoor or outdoor.

9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

2.5 HANGERS AND SUPPORTS

A. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

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. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches ().

J. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg () and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (): Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.

9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg () and Lower: Seal Class C.

10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (): Seal Class B.

11. Conditioned Space, Exhaust Ducts: Seal Class B.

12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.3 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. 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.

3.4 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 START UP

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

END OF SECTION

SECTION 233300

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Flange connectors.
4. Flexible connectors.
5. Duct accessory hardware.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 ().
2. Exposed-Surface Finish: Mill phosphatized.

2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Cesco Products; a division of Mestek, Inc.
2. Greenheck Fan Corporation.
3. Nailor Industries Inc.
4. Ruskin Company.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 1000 fpm () .

D. Maximum System Pressure: 1-inch wg ().

E. Frame: Hat-shaped, 0.05-inch- () thick, galvanized sheet steel , with welded corners or mechanically attached and mounting flange.

F. Blades: Multiple single-piece blades, center pivoted, maximum 6-inch () width, 0.025-inch- () thick, roll-formed aluminum with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Felt.

I. Blade Axles:

1. Material: Nonferrous metal .
2. Diameter: 0.20 inch ().

J. Tie Bars and Brackets: Aluminum.

K. Return Spring: Adjustable tension.

L. Bearings: Steel ball.

M. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Screen Mounting: Front mounted in sleeve.
   a. Sleeve Thickness: 20 gage () minimum.
   b. Sleeve Length: 6 inches () minimum.
3. Screen Material: Galvanized steel.
4. Screen Type: Insect.
5. 90-degree stops.

2.4 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Flexmaster U.S.A., Inc.
   b. McGill AirFlow LLC.
   c. Nailor Industries Inc.
   d. Ruskin Company.
2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:
   a. Frame: Hat-shaped, 0.094-inch- () thick, galvanized sheet steel.
   b. Mitered and welded corners.
   c. Flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Galvanized-steel, 0.064 inch () thick.
6. Blade Axles: Galvanized steel.
7. Bearings:
   a. Oil-impregnated bronze.
   b. Dampers in ducts with pressure classes of 3-inch wg () or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

B. Standard, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. McGill AirFlow LLC.
   b. Nailor Industries Inc.
   c. Ruskin Company.
2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames: Hat-shaped, 0.10-inch- () thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Roll-Formed Aluminum Blades: 0.10-inch- () thick aluminum sheet.
6. Blade Axles: Galvanized steel.
7. Bearings:
   a. Oil-impregnated bronze.
   b. Dampers in ducts with pressure classes of 3-inch wg () or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Aluminum.

C. Jackshaft:

1. Size: 0.5-inch () diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

D. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- () thick zinc-plated steel, and a 3/4-inch () hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.5 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.

B. Noninsulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire.

1. Pressure Rating: 10-inch wg () positive and 1.0-inch wg () negative.
2. Maximum Air Velocity: 4000 fpm ().

3. Temperature Range: Minus 10 to plus 160 deg F ().

C. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.

1. Pressure Rating: 10-inch wg () positive and 1.0-inch wg () negative.

2. Maximum Air Velocity: 4000 fpm ().

3. Temperature Range: Minus 20 to plus 210 deg F ().

D. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action Nylon strap in sizes 3 through 18 inches (), to suit duct size.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, and aluminum accessories in aluminum ducts.

C. Install volume dampers at points on outside and return air systems as required. 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.

D. Install flexible connectors to connect ducts to equipment.

E. Connect terminal units to supply ducts directly or with maximum 12-inch () lengths of flexible duct. Do not use flexible ducts to change directions.

F. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch () lengths of flexible duct clamped or strapped in place.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.

2. Inspect turning vanes for proper and secure installation.

END OF SECTION

SECTION 233423

HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ceiling-mounted ventilators.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

PART 2 - PRODUCTS

2.1 CEILING-MOUNTED VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Broan-NuTone LLC; NuTone Inc.

2. Panasonic.

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Plastic, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.

2. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.

3. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.

4. Isolation: Rubber-in-shear vibration isolators.

5. Manufacturer's standard wall cap, and transition fittings.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Mounting:

1. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

B. Install units with clearances for service and maintenance.

C. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.

2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.

3. Verify that adjusting are complete.

4. Adjust damper linkages for proper damper operation.

5. Verify lubrication for bearings and other moving parts.

6. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.

7. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.

8. Shut unit down and reconnect automatic temperature-control operators.

9. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

C. Replace fan and motor pulleys as required to achieve design airflow.

D. Lubricate bearings.

END OF SECTION

SECTION 233713

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adjustable bar registers and grilles.
2. Fixed face registers and grilles.

B. Related Sections:

1. Section 233300 "Air Duct Accessories" for fire dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 REGISTERS AND GRILLES

A. Adjustable Bar Register :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Carnes.
   b. Hart & Cooley Inc.
   c. Krueger.
   d. METALAIRE, Inc.
   e. Price Industries.
   f. Titus.
   g. Tuttle & Bailey.
   h. Pro Select
2. Material: Steel.
3. Finish: Baked enamel, white .
4. Face Blade Arrangement: Horizontal spaced 3/4 inch () apart.
5. Core Construction: Integral.
6. Frame: 1 inch () wide.
7. Mounting: Countersunk screw.
8. Damper Type: Adjustable opposed blade.
9. Accessories:
   a. Front -blade gang operator.
   b. Filter.

B. Adjustable Bar Grille :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Carnes.
   b. Krueger.
   c. METALAIRE, Inc.
   d. Titus.
   e. Pro Select.
2. Material: Steel.
3. Finish: Baked enamel, white .
4. Face Blade Arrangement: Horizontal spaced 3 inches () 3/4 inch () apart.
5. Core Construction: Integral.
6. Frame: 1 inch () wide.
7. Mounting: Countersunk screw.

C. Fixed Face Register :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Carnes.
   b. Krueger.
   c. Titus.
2. Material: Steel.
3. Finish: Baked enamel, white .
4. Face Arrangement: 1/2-by-1/2-by-1/2-inch () grid core.
5. Core Construction: Integral.
6. Frame: 1 inch () wide.
7. Mounting: Countersunk screw.
8. Damper Type: Adjustable opposed blade.
9. Accessory: Filter.

D. Fixed Face Grille :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Carnes.
   b. Krueger.
   c. Titus.
   d. Pro Select.
2. Material: Steel.
3. Finish: Baked enamel, white .
4. Face Arrangement: 1/2-by-1/2-by-1/2-inch () grid core.
5. Core Construction: Integral.

6. Frame: 1 inch () wide.

7. Mounting: Countersunk screw.

8. Accessory: Filter.

2.2 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

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.
3. General Cable Technologies Corporation.
4. Service Wire Co.
5. Southwire Company.

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."

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper for feeders smaller than No. 4 AWG; copper for feeders No. 4 AWG and larger. Conductors shall be 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 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.

3.3 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**].

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inche () ()s of slack.

3.4 IDENTIFICATION

A. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.5 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

END OF SECTION

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

a. Section includes grounding and bonding systems and equip

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. Burndy; Part of Hubbell Electrical Systems.
2. ERICO International Corporation.
3. Harger Lightning & Grounding.
4. ILSCO.
5. O-Z/Gedney; a brand of Emerson Industrial Automation.
6. Thomas & Betts Corporation, A Member of the ABB Group.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

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.

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.
4. Single-phase motor and appliance branch circuits.
5. Armored and metal-clad cable runs.

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.

END OF SECTION

SECTION 260533

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.

2. Nonmetal conduits, tubing, and fittings.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. EMT: Comply with ANSI C80.3 and UL 797.

C. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

D. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.

2. Fittings for EMT:

a. Material: Steel.

b. Type: Compressionet

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (), with overlapping sleeves protecting threaded joints.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

C. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.

2. Connection to Vibrating Equipment (Including Transformers and Hydraulic,

3. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X.

B. Indoors: Apply raceway products as specified below unless otherwise indicated.

1. Exposed, Not Subject to Physical Damage: EMT.

2. Concealed in Ceilings and Interior Walls and Partitions: EMT.

3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.

4. Boxes and Enclosures: NEMA 250, Type 4X.

C. Minimum Raceway Size: 3/4-inch () trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.

2. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.

3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install surface raceways only where indicated on Drawings.

F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F ().

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches () away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Arrange stub-ups so curved portions of bends are not visible above finished slab.

D. 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.

E. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

F. Support conduit within 12 inches () of enclosures to which attached.

G. 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.

H. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

I. 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.

J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb () tensile strength. Leave at least 12 inches () of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

K. 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.

L. 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.

M. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches () of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.

2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

N. 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 center of box unless otherwise indicated.

O. 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 the box and cover plate or the supported equipment and box.

P. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Q. Locate boxes so that cover or plate will not span different building finishes.

R. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

END OF SECTION

SECTION 260923

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Indoor occupancy and vacancy sensors.
2. Switchbox-mounted occupancy and vacancy sensors

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.

1. Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY AND VACANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:

1. Cooper Industries, Inc.
2. Hubbell Building Automation, Inc.
3. Leviton Manufacturing Co., Inc.
4. Lightolier Controls.
5. Lithonia Lighting; Acuity Brands Lighting, Inc.
6. Lutron Electronics Co., Inc.
7. Sensor Switch, Inc.
8. Watt Stopper.

C. General Requirements for Sensors:

1. Ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
2. Dual technology.
3. Separate power pack.
4. Hardwired connection to switch.
5. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
6. Operation:

a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

c. Combination Sensor: Unless otherwise indicated, sensor shall be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

7. Sensor Output: Sensor is powered from the power pack.

8. Power: Line voltage.

9. Power Pack: Dry contacts rated for 20-A LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.

10. Mounting:

a. Sensor: Suitable for mounting in any position on a standard outlet box.

b. Relay: Externally mounted through a 1/2-inch () knockout in a standard electrical enclosure.

c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

11. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.

12. Bypass Switch: Override the "on" function in case of sensor failure.

13. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (); turn lights off when selected lighting level is present.

D. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.

2. Detector Sensitivity: Detect occurrences of 6-inch- () minimum movement of any portion of a human body that presents a target of not less than (), and detect a person of average size and weight moving not less than () in either a horizontal or a vertical manner at an approximate speed of .

3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a () high ceiling.

4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet () when mounted () above finished floor.

2.2 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:

1. Cooper Industries, Inc.

2. Hubbell Building Automation, Inc.

3. Leviton Manufacturing Co., Inc.

4. Lithonia Lighting; Acuity Brands Lighting, Inc.

5. Lutron Electronics Co., Inc.

6. Watt Stopper.

C. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
4. Switch Rating: Not less than 800-VA LED load at 120 V, 1200-VA LED load at 277 V, and 800-W incandescen
5.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.

C. 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.

D. 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.

E. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Lighting control devices will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.

END OF SECTION

SECTION 262726

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Weather-resistant receptacles.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 GFCI RECEPTACLES

A. General Description:

1. Straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 15A and 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Cooper; VGF20.
   b. Hubbell; GFR5352L.
   c. Pass & Seymour; 2095.
   d. Leviton; 7590.

2.4 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Steel with white baked enamel, suitable for field painting.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Metal with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant thermoplastic with lockable, extra duty 'while in use" cover.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
   a. Cut back and pigtail, or replace all damaged conductors.
   b. Straighten conductors that remain and remove corrosion and foreign matter.
   c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches () in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.

8. Tighten unused terminal screws on the device.

9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. 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.

H. Adjust locations of service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

END OF SECTION

SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nonfusible switches.

1.2 ACTION SUBMITTALS

A. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.

2. Include wiring diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

1.4 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: **One** year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

C. Comply with NFPA 70.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.

2. General Electric Company.

3. Siemens Industry, Inc.

4. Square D; by Schneider Electric.

B. Type GD, General Duty, Single Throw, 240-V ac, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.

2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

PART 3 - EXECUTION

3.1 INSTALLATIONCoordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

C. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NFPA 70 and NECA 1.

3.2 IDENTIFICATION

END OF SECTION

SECTION 265119

LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 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.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, arranged by designation.

1.3 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: **Five** year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Standards:

1. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

2. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

3. UL Listing: Listed for damp location.

4. Recessed luminaires shall comply with NEMA LE 4.

C. CRI of **80** .

D. Rated lamp life of **50,000** hours to L70.

E. Internal driver.

F. Nominal Operating Voltage: **120 V ac**.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports: Sized and rated for luminaire weight.

E. Flush-Mounted Luminaire Support: Secured to outlet box.

F. Wall-Mounted Luminaire Support:

1. Secured to outlet box

2. Do not attach luminaires directly to gypsum board.

G. Ceiling-Mounted Luminaire Support:

1. Secured to outlet box

2. Ceiling mount with hook mount.

H. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION

SECTION 265219

EMERGENCY AND EXIT 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:

1. Emergency lighting units.
2. Exit signs.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Emergency Lighting Unit: A lighting unit with internal or external emergency battery powered supply and the means for controlling and charging the battery and unit operation.

D. Fixture: See "Luminaire" Paragraph.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of emergency lighting unit, exit sign, and emergency lighting support.

1. Include data on features, accessories, and finishes.
2. Include physical description of the unit and dimensions.
3. Battery and charger for light units.
4. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.6 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Warranty Period: **Two** year(s) from date of Substantial Completion.

B. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Fabricate and label emergency lighting units, exit signs, and batteries to comply with UL 924.

C. Comply with NFPA 70 and NFPA 101.

D. Comply with NEMA LE 4 for recessed luminaires.

E. Comply with UL 1598 for fluorescent luminaires.

F. Bulb Shape: Complying with ANSI C79.1.

G. Internal Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body.

1. Test Push-Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.

a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.

b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2. Battery: Sealed, maintenance-free, **nickel-cadmium** type.

3. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.

2.2 EMERGENCY LIGHTING

A. General Requirements for Emergency Lighting Units: Self-contained units.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cooper Lighting, an Eaton business.

b. Dual-Lite.

c. Lightolier; a Philips group brand.

d. Lithonia Lighting; Acuity Brands Lighting, Inc.

2.3 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Manufacturers: Subject to compliance with requirements, :

a. Amerlux.

b. Cooper Lighting, an Eaton business.

c. Hubbell Industrial Lighting; Hubbell Incorporated.

d. Lithonia Lighting; Acuity Brands Lighting, Inc.

e. Philips Lighting Company.

f. Ruud Lighting Direct.

g. Dual-Lite.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of luminaires.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

C. Examine walls, floors, roofs, and ceilings for suitable conditions where emergency lighting luminaires will be installed.

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

3.2 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. 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.

3.4 ADJUSTING

A. Adjustments: Within **12** months of date of Substantial Completion, provide on-site visit to do the following:

1. Inspect all luminaires. Replace lamps, **emergency power units, batteries, signs,** or luminaires that are defective.

a. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

2. Conduct short-duration tests on all emergency lighting.

END OF SECTION

SECTION 265619

EXTERIOR 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:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire-mounted photoelectric relays.

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. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaire.
4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
5. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

1.5 QUALITY ASSURANCE

A. Provide luminaires from a single manufacturer for each luminaire type.

B. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.7 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Warranty Period: **2** year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Lamp base complying with **ANSI C81.61**.

C. Bulb shape complying with ANSI C79.1.

D. CRI of **minimum 80**.

E. L70 lamp life of **50,000** hours.

F. Lamps dimmable from 100 percent to 0 percent of maximum light output.

G. Internal driver.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.
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.

F. Wiring Method: Install cables in raceways. Conceal raceways and cables.

G. **Install luminaires level, plumb, and square with finished grade unless otherwise indicated.**

H. Coordinate layout and installation of luminaires with other construction.

I. Adjust luminaires that require field adjustment or aiming. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.2 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- () thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. 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. Verify operation of photoelectric controls.

C. Illumination Tests:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Luminaire will be considered defective if it does not pass tests and inspections.

3.4 ADJUSTING

A. Occupancy Adjustments: When requested within **12** months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to **two** visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.

2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

END OF SECTION