

6

CITY OF BALTIMORE
BRANDON M. SCOTT
Mayor

DEPARTMENT OF RECREATION AND PARKS
Reginald Moore
Director



CONTRACT RP 24821R

Volume 2 of 3

FOR

PATTERSON PARK POOL HOUSE
RENOVATION

148 S LINWOOD AVE, BALTIMORE, MD 21224

**VI. CONSTRUCTION DETAILS AND
MATERIALS**

SECTION 01 10 00 - SUMMARY**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes (not exclusively) the following:
 - 1. Work covered by the Contract Documents.
 - 2. Type of the Contract.
 - 3. Use of premises.
 - 4. Work restrictions.
 - 5. Specification formats and conventions.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Patterson Park House Renovation
- B. Location: 148 S Linwood Ave, Baltimore, MD 21224
- C. Engineer: City of Baltimore Department of Recreation and Parks.
- D. Architect: GWWO INC, 125 E Fort Ave Suite 24, Baltimore, MD 21230
- E. The work consists of, but is not restricted to, the following:
 - 1. Selective Demolition
 - 2. Renovation of Existing Building
 - 3. Loker Room Addition
 - 4. Entry Construction
 - 5. Site Improvement
 - 6. Associated Mechanical, Electrical, and Plumbing Work

1.4 TYPE OF CONTRACT

- A. Project will be constructed under a single prime contract.

1.5 USE OF PREMISES

- A. General: Contractor shall have limited use of premises for construction operations, as limited to the area of work required for new work shown on the construction documents, and for the time period required to perform said work.

- B. Use of Site: Limit use of premises to areas within the Contract limits indicated, and for the time period required to perform said work. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Driveways and Entrances: Keep loading areas, and entrances serving premises clear and available to Engineer, Engineer 's employees and contractors, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of loading areas and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
 2. Owner reserves the right to require contractor to vacate specific locations/portions of the project where construction is substantially complete. At that time Contractor will adjust construction fencing and/or barriers to match reduced construction site. This vacation is commensurate with contractor ceasing all use, and Owner assuming responsibility for conditions of, said location.

1.6 CONSTRUCTION SEQUENCE

- A. Demolition shall be accomplished in a carefully planned phased manner in order to maintain the structural integrity of structures on site that are existing to remain.

1.7 WORK RESTRICTIONS

- A. Existing Utility Interruptions: Do not interrupt utilities serving facilities currently occupied by others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Engineer not less than 11 days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Engineer's written permission.

1.8 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "Master Format" numbering system.
1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used.
 2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall

be interpreted as plural and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
3. The word "days" refers to Calendar days unless specified otherwise.
4. "*Days of Completion*" in the Bid Form refers to a period beginning at *Notice to Proceed* and ending at *Final Completion*.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 20 00 - MEASUREMENT AND PAYMENT**PART 1-GENERAL****1.1 BASIS OF PAYMENTS**

- A. Payment for work completed under this Contract will be made for the lump sum price and for the unit bid price. All prices shall include the furnishing of all labor, tools, equipment and materials and the performance of all work required to satisfactorily complete the Project as indicated and specified in the Contract documents and as determined by the Engineer. References to methods of measurement and/or payment in Standard Specifications, which are made part of the Specifications by reference for materials and construction, will not apply. Only the methods of measurement and payment outlined in this section will apply to the Bid items.
- B. Partial payments will be made on the basis of percentage complete of the construction categories as listed in the approved SCHEDULE OF VALUES. See 01 29 00.

1.2 ALTERNATE BID ITEMS

- A. Alternate Bid Items may be increased, decreased, or eliminated entirely. Alternate Bid Items may be included in the proposal for the sole purpose of providing for either an increase or decrease in lump sum items where specifically indicated in the Construction Detail/ Specifications. Alternate Bid Prices shall be used in determining the "Total Bid". Acceptance of Alternates for completion rests entirely on the Engineer at the Department of Recreation and Parks.

Alternate Bid Items are items of work performed only when approved by the Engineer, the Department of Recreation and Parks, and are shown as part of the specific scope of the work outlined by the Drawings and the Specifications. The Specifications will govern the quality of the materials and performance of the workmanship used for the Alternate Bid Items. The items will be performed only if accepted by the Engineer at the Department of Recreation and Parks. The Contractor shall not have the right to demand payment for loss of profit and overhead due to these items not being used in the work.

- B. Measurement and Payment of these items will be based on the "Bid Schedule", in compliance with the bid documents.

The lump sum price for each of these items shall include full compensation for all work shown in the Drawings and the Specifications, see 01 23 00 Alternate Bid Items.

- 1 Roof Improvements

PART 2 - PRODUCTS - NOT USED**PART 3 - EXECUTION - NOT USED**

END OF SECTION

SECTION 01 22 00 - BID ITEMS**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 unit prices.
- B. Related Requirements:
 - 1. Section 01 26 00 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.3 DEFINITIONS

- A. Unit prices : The contractor shall Bid and accept a "unit price" for each of the unit price items in the Bid. The price per unit shall be multiplied by the estimated quantity of each item to tabulate the total estimated price for these items. This total price shall be added to the other Bid items in the Bid to arrive at a Bid total for comparison of Bids and award of Contract.
- B. Lump Sum Prices : The Contractor shall Bid and accept a price for each of the "lump sum" items in the Bid. "Lump Sum" prices constitute full payment for all Work called for under these items. Any alterations to Contracted "lump sum" Bid Items resulting in additional work or materials shall be paid for by the Owner, and conversely, resulting in reduced work or materials shall be credited to the Owner.

1.4 PROCEDURES

- A. Bid Items include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of Bid Items. Methods of measurement and payment for Bid Items are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION****3.1 LIST OF UNIT PRICES****A. Item Unit No. 101 – Project Complete**

1. Description: Item shall include full compensation of all work shown on the drawings as outlined in the Specifications with the exception of Bid items Items 102-3103.
2. Unit of Measurement: Lump Sum

B. Item Unit No. 102 - Demolition

1. Description: Removal and off-site disposal of elements shown to be demolished as indicated on the Drawings and Specifications, and in accordance with applicable laws.
2. Unit of Measurement: Lump Sum based on survey before and after installation

C. Item Unit No. 301 - Concrete Patch for utility connections

1. Description: Installation of concrete patching. Include 4" concrete slab, wire reinforcement, 4" CR-6 base course, moisture barrier, and turndown ledge where the new patch meets the existing slab.
2. Unit of Measurement: Lump Sum based on survey before and after installation

D. Item Unit No. 302 - Foundations at Lockers

1. Description: Installation of reinforced concrete footing. Size of footing shall be 2'-4"W x 1'-0"H. Include rebar reinforcement. Assume an elevation of 4'-4" to bottom of footing.
2. Unit of Measurement: Lump Sum based on survey before and after installation

E. Item Unit No. 303 - Concrete Pad at Lockers

1. Description: Installation of additional slab on grade. Include 4" concrete slab, wire reinforcement, 4" CR-6 base course, and broom finish.
2. Unit of Measurement: Lump Sum based on survey before and after installation

F. Item Unit No. 304 - Entry Foundation

1. Description: Installation of additional reinforced concrete footing. Size of footing shall be 2'-0"SQ x 2'-6"H. Include rebar reinforcement. Assume an elevation of 3'-2" to bottom of footing.
2. Unit of Measurement: Lump Sum based on survey before and after installation

G. Item Unit No. 401 - CMU Walls

1. Description Installation of CMU wall.
2. Unit of Measurement: Lump Sum based on survey before and after installation

H. Unit Price No. 501: Structural and Misc. Metals at Entry Gate

1. Description: Installation of all metal components associated with the new entry.
2. Unit of Measurement: Lump Sum based on survey before and after installation

I. Unit Price No. 701: Soffit and Fascia Replacement

1. Description: Installation of additional soffit and fascia. Assume that the assembly is per the typical replacement detail on the drawings. Include blocking and soffit vent.
2. Unit of Measurement: Lump Sum based on survey before and after installation

O. Unit Price No. 702: Roof Structure over Lockers

1. Description: Installation of additional Roof Type 1.01. Include framing, sheathing, and underlayment. Do not include shingles in this unit price.
2. Unit of Measurement: Lump Sum based on survey before and after installation

Q. Unit Price No. 703: Shingles at Lockers

1. Description: Installation of additional architectural roof shingles.
2. Unit of Measurement: Lump Sum based on survey before and after installation

U. Unit Price No.801: Storefront Windows

1. Description: Installation of thermally-broken, aluminum, exterior storefront. Include insulated glazing unit, and all associated shims and fasteners. Assume an anodized finish.
2. Unit of Measurement: Lump Sum based on survey before and after installation

V. Unit Price No. 802: Doors

1. Description: Installation of extra-heavy duty, exterior, thermally insulated hollow metal door and frame. Finish shall be field painted over A60 galvanized coating. Provide all associated fasteners and grout for frame. Provide all hardware required for fully operational door and exit device.
2. Unit of Measurement: Lump Sum based on survey before and after installation

Z. Unit Price No. 901: Ceilings

1. Description: Installation of suspended GWB ceiling. Assume GWB is 1/2" mold resistant board. Include all wires, suspension systems, grids, and appurtenances.
2. Unit of Measurement: Lump Sum based on survey before and after installation

AA. Unit Price No. 902: High Performance Coatings

1. Description: Installation of additional high-performance coatings over existing glazed block. Include Primer: Tnemec Series 108 ProBond at 1.0-2.0 mils, First Coat: Tnemec Series 288 Enviro-Pox at 2.0-4.0 mils DFT, and Finish Coat: Tnemec Series 288 Enviro-Pox at 2.0-4.0 mils DFT.
2. Unit of Measurement: Lump Sum based on survey before and after installation

AB. Unit Price No. 903: Epoxy Flooring

1. Description: Installation of additional epoxy flooring with broadcast aggregate. Include primer, first and second coats, and topcoat.
2. Unit of Measurement: Lump Sum based on survey before and after installation

AC. Unit Price No. 1001: Toilet Partitions

1. Description: Installation of an additional floor-mounted, headrail-braced, 1" HPDE toilet partition. Include all fasteners and appurtenances. Assume 36"W x 60"D.
2. Unit of Measurement: Lump Sum based on survey before and after installation

AD. Unit Price No. 1002: Restroom Accessories

1. Description: Provide installation of a surface-mounted restroom accessory. Do not include the price of the accessory in this unit price.

Unit of Measurement: Lump Sum based on survey before and after installation

AG. Unit Price No. 1003: Storage Shelving

1. Description: Installation of an additional 16 Ga. steel, post-and-beam shelving unit. Assume 3'-0"W x 7'-6"H x 2'-0"D.
2. Unit of Measurement: Lump Sum based on survey before and after installation

AH. Unit Price No. 1201: Casework

1. Description: Installation of additional base cabinet. Assume custom grade per AWS, high pressure decorative laminate over MDF core. Include all hardware and fasteners.
2. Unit of Measurement: Lump Sum based on survey before and after installation

AI. Unit Price No. 2201: Plumbing Fixtures

1. Description: Installation of an additional wall-hung water closet. Include flush valve, wall carrier, seat, and associated appurtenances.
2. Unit of Measurement: Lump Sum based on survey before and after installation

AM. Unit Price No. 2202: Domestic Water Distribution

1. Description: Complete installation of the water distribution system in the entire project.
2. Unit of Measurement: Lump Sum based on survey before and after installation

AN. Unit Price No. 2203: Domestic Water Heater

1. Description: Installation of an additional electric water heater. Assume 119 gallons.
2. Unit of Measurement: Lump Sum based on survey before and after installation

AO. Unit Price No. 2204: Drainage - Brake Metal Gutter and Downspout

1. Description: Installation of additional brake metal gutter. Provide fasteners and all associated appurtenances.
2. Unit of Measurement: Lump Sum based on survey before and after installation

AP. Unit Price No. 2301: HVAC

1. Description: Complete installation of the HVAC system in the entire project.
2. Unit of Measurement: Lump Sum based on survey before and after installation

AQ. Unit Price No. 2601: Electrical Service and Distribution

1. Description: Installation of an additional tamper-resistant duplex receptacle. Assume 20A, 120V, NEMA 5-20R. Include conduit and homerun back to panel.
2. Unit of Measurement: Lump Sum based on survey before and after installation

AR. Unit Price No. 2602: Lighting

1. Description: Installation of an additional "D" light fixture. Include trim, wiring, and associated appurtenances.
2. Unit of Measurement: Lump Sum based on survey before and after installation

AS. Unit Price No. 2603: Alarm Systems

1. Description: Installation of an additional combination horn and speaker device. Include wiring and associated appurtenances.
2. Unit of Measurement: Lump Sum based on survey before and after installation

AT. Unit Price No. 3101: Site Preparation

1. Description: Uniformly grade areas up to subgrade. Comply with specified compaction requirements and applicable laws.
2. Unit of Measurement: Lump Sum based on survey before and after

installation AU. Unit Price No. 3102: Site Improvements

1. Description: Installation of additional sidewalk paving. Include 5" concrete slab, wire reinforcement, 4" CR-6 base course, and broom finish.
2. Unit of Measurement: Lump Sum based on survey before and after

installation AV. Unit Price No. 3103: Decorative Metal Fence and Gate

1. Description: Installation of additional decorative fencing. Basis of Design shall be Montage II Welded and Racakabe Ornametal Steel, Majestic, Extended Picket Style, 3-Rail style by Ameristar Fence.
2. Unit of Measurement: Lump Sum based on survey before and after installation

END OF SECTION 01 22 00

SECTION 01 23 00 - ALTERNATES**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 necessary to prepare Bids and process Applications for Payment.

1.3 DEFINITIONS

- A. Alternate: A portion of The Work bid separately from the Base Bid.
- B. Base Bid: The primary portion of The Work, by default, bid part and parcel to award and construction.

1.4 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Engineer's option. Accepted Alternates will be identified in the Engineer-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.5 SCHEDULE OF ALTERNATES**A. Alternate No. 1 – Roof Improvements**

- 1. Alternate Bid Item: Provide all labor, materials, equipment, and supervision necessary to complete roof improvements, including removal of existing asphalt shingles and underlayment, and disposal of all materials off-site in accordance with applicable laws and regulations. Install new asphalt shingles, including underlayment and all required accessories, complete and ready for use, as indicated on the Drawings and in accordance with Specification Section 07 31 13.

PART 2 - PRODUCTS - NOT USED**PART 3 - EXECUTION - NOT USED****END OF SECTION**

SECTION 01 25 00 - SUBSTITUTION PROCEDURES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Engineer that are not required in order to meet other Project requirements but may offer advantage to Contractor or Engineer.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit to the Engineer one electronic copy 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 or facsimile of form provided in Project Manual.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Engineer and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

- e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of Engineers.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within 7 business days of receipt of a request for substitution. Engineer will notify Contractor of acceptance or rejection of proposed substitution within 21 days of receipt of request, or 7 business days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Engineer's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Engineer does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

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

1.6 PROCEDURES

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

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 21 days prior to time required for preparation and review of related submittals, in order to meet Construction Schedule.

1. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 MINOR CHANGES IN THE WORK

- A. Engineer 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."

1.4 PROPOSAL REQUESTS

- A. Engineer-Initiated Proposal Requests: Engineer 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. Work Change Proposal Requests (WCPR) issued by Engineer are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request 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. If Contractor determines Construction Schedule will require modification, 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.

- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change.

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. If Contractor determines Construction Schedule will require modification, 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.
5. Comply with requirements in Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
6. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

1.5 CHANGE ORDER PROCEDURES

- A. On Engineer's approval of a Work Changes Proposal Request, Engineer will issue a Change Order for signatures of Engineer and Contractor on AIA Document.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Engineer 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 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 DEFINITIONS

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

1.4 SCHEDULE OF VALUES

- A. The Contractor shall submit to the Engineer within 14 days after Notice of Award a Schedule of Values. The Schedule shall add up to the full 100% value of the lump sum bid (Bid Item 101), plus any Alternates selected by the Engineer. The primary items of The Schedule should be broken down into the following categories with further breakdowns within those categories. The Schedule shall be used for the purpose of arriving at a basis of partial payments to the Contractor for each construction category

SCHEDULE OF VALUES

Construction Categories and Sub-categories

1. Bonds and Insurance
2. Mobilization
3. Construction Stakeout
4. Soil Erosion, Sediment Control and Tree Protection
5. Site Clearing
6. Existing Asphalt Pavement Removal
7. Existing Concrete (et. Al.) Pavement Removal
8. Selective Demolition
 - a. Main Building
 - b. Site and all Else
9. Grubbing, Tree and Vegetation Removal
10. Rooting Pruning
11. Topsoil Stripping and Stockpiling
12. Earthwork Excavation and Filling
13. Earthwork Support and Containment
14. Earthwork Dewatering

15. Termite Control
16. Final Grading
17. Chain Link Fences and Gates
18. Ornamental Fences and Gates
19. Sanitary Sewerage Utilities
20. Storm Water Drainage, Filtration, etc.
21. Storm Water Utilities, Inlets
22. Underground Ducts and Utility Structures
23. Water Utilities
24. Cast-in-Place Concrete
25. Unit Masonry
 - a. Sub-Grade
 - b. Above Grade
26. Structural steel
27. Steel joists
28. Steel Decking
29. Acoustical Steel Decking
30. Metal Canopies
31. Miscellaneous Metal Fabrications
32. Metal Stairs
33. Pipe and Tube Railings
34. Decorative Metal Railings
35. Cold-Formed Metal Framing
36. Non-Structural Metal Framing
37. Rough Carpentry
38. Finish Carpentry
39. Architectural Casework
40. Sheet Waterproofing
41. Weather Barriers
42. Thermal insulation
43. Metal Composite Material Wall Panels
44. Rainscreen Attachment System
45. Sheet metal flashing and trim
46. Roof Accessories
47. Roofing
48. Applied Fire Protection
49. Firestopping
50. Joint Sealants and Expansion Joint Assemblies
51. Hollow Metal Doors and Frames
52. Flush Wood Doors
53. Access Doors
54. Other Doors
55. Aluminum-Framed Storefronts
56. Curtainwall
57. Glazing
58. Mirrors
59. Skylights
60. Louvers
61. Door Hardware
62. Gypsum Board Assemblies
63. Tiling
64. Acoustical Ceilings
65. Wood Strip Flooring
66. Resilient Flooring
67. Resilient Athletic Flooring
68. Tile Carpeting

69. Wall Coverings
70. Acoustical Wall and Ceiling Units
71. Painting and Coating
72. High Performance Coatings
73. Visual Display Units
74. Signage
75. Traffic Signage
76. Plastic Toilet Compartments
77. Operable Partitions
78. Toilet, Bath, And Laundry Accessories
79. Fire Protection Specialties
80. Lockers
81. Metal Storage Shelving
82. Wall-mounted Standards and Shelving
83. Appliances
84. Projection Screens
85. Gymnasium Equipment
86. Fitness Equipment
87. Office and Lounge Furniture
88. Window Shades
89. Entrance Floor Mats
90. Telescoping Bleachers
91. Playground Equipment
92. Site Furnishings
93. Specialty Acoustical Control Systems
94. Wet-pipe Sprinkler Systems
95. Domestic Piping/Plumbing
 - a. Sleeves, Seals, Escutcheons
 - b. Meters and Gauges
 - c. Valves
 - d. Check Valves
 - e. Gate Valves
 - f. Hangers and Supports
 - g. Insulation
 - h. Specialties
 - i. Inline Pumps
 - j. Water Heaters
 - k. Commercial Plumbing Fixtures
 - l. Emergency Plumbing Fixtures
96. Pressure Water Coolers
97. Sanitary Waste and Vent
 - a. Piping
 - b. Drain
 - c. Specialties
98. Storm Drainage
 - a. Piping
 - b. Specialties
99. Sump Pumps
100. HVAC
 - a. Ducting
 - b. Metal
 - c. Non-Metal

- d. Flexible
 - e. Accessories
 - f. Vibration Controls
 - g. Piping
 - h. Insulation
 - i. Ducts
 - j. Piping
 - k. Equipment
 - l. Meters and Gauges
 - m. Valves
 - n. Check Valves
 - o. Gate Valves
 - p. Specialties
 - q. Gravity Ventilators
 - r. Power Ventilators
 - s. Control Valves
 - t. Control Dampers
 - u. Pressure Instruments
 - v. Temperature Instruments
 - w. Hangers & Supports
 - x. Testing, Adjusting, and Balancing
101. Hydronic
- a. Piping
 - b. Specialties
 - c. Pumps
 - d. Water Treatment
 - e. Air Coils
102. Air Terminal Units
103. Air Devices
104. Fabric Air Distribution Devices
105. Basic Indoor Air Handling Units
106. Split System Air-Conditioners
107. Unit Heaters
- a. Cabinet
 - b. Propeller
 - c. Wall & Ceiling
108. Refrigerant Piping
109. Natural Gas Piping and Specialties
110. Pool Water Heaters
111. Packaged Variable Air Volume Unit
112. Packaged Rooftop Units
113. Direct Digital Control (DDC) System For Hvac
114. Electrical
- a. Raceways and Boxes
 - b. Conduits
 - c. Wiring Devices
 - d. Hangers and Supports
 - e. Switches & Circuit Breakers
 - f. Fuses

- g. Variable Frequency Drive
- 115. Electrical Metering
- 116. Electrical Panelboards
- 117. Manual Transfer Switch
- 118. Portable Generator
- 119. Grounding and Bonding
- 120. Lighting
 - a. Controls
 - b. Panels
 - c. Interior Devices
 - d. Exterior Devices
- 121. Low-Voltage Electrical Power Conductors & Transformers
- 122. Data Cabling
- 123. Fire-alarm System
- 124. Security Camera Systems
- 125. Burglar-Alarm Systems
- 126. DAS/ECCCS Systems
- 127. Audio Visual Systems
- 128. Landscaping
 - a. Seeding and Mulching
 - b. Plants
 - c. Trees
- 129. Playground Surface Systems
- 130. Pavement Markings
- 131. Rigid Paving
- 132. Unit Paving
- 133. Overcurrent Protective Device Coordination Study
- 134. Closeout
 - a. General
 - b. As-Builts
 - c. Facility Manual
 - d. Commissioning

- B. Item #4 shall be subdivided into the costs for incremental installation of sediment control devices as required by the Sequence of Construction indicated on the Drawings. Payment under this break down will be limited to an initial payment of 50 percent of the value for devices installed for each increment of sediment control required for that Sequence of Construction at the first monthly estimate after satisfactory installation. The remaining 50 percent payment of the incremental sediment control devices will be made monthly for the duration those devices are required and properly maintained to the satisfaction of the Engineer.

1.5 SCHEDULE OF VALUES COORDINATION

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's Construction Schedule.
1. Coordinate 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.
2. The Schedule shall add up to the full 100% value of the lump sum bid. The Schedule shall be used for the purpose of arriving at a basis of partial payments to the Contractor for each construction category.
 3. Engineer reserves the right to require line item breakdowns in the Schedule of Values as required to facilitate accurate payment applications and approvals for the project. Initial Applications for Payment may not be submitted until Engineer has approved the Schedule of Values including any line item breakdowns required.
- B. Format and Content: Use 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 Engineer.
 - c. Engineer's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 2. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts where appropriate.
 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. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

7. 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 as separate line items
8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.6 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Engineer and paid for by Engineer.
 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 Engineer 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.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Engineer 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 of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- 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 Engineer, 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. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

- F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Engineer 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 lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
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. Engineer reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Engineer.
- 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 (approved if not final).
 4. Products list (approved if not final).
 5. Schedule of unit prices.
 6. Submittal schedule (approved if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
 13. Certificates of insurance and insurance policies.
 14. Performance and payment bonds.
 15. Data needed to acquire insurance.
- I. Application for Payment at Substantial Completion: After Engineer issues 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 Certificate(s) of Substantial Completion issued previously for Engineer occupancy of designated portions of the Work.
- J. Final Payment Application: After completing Project closeout requirements, 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative provisions for coordinating construction operations on The Project including, but not limited to, the following:
1. General coordination procedures.
 2. Project meetings.
 3. RFIs.

1.2 DEFINITIONS

- A. RFI: Request for Information. Request from City, Engineer, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

- A. 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, telephone number, and email address 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.

1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
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. Removal of any existing elements and constructions necessary for proper completion of the Work, including but not limited to those explicitly shown on the plans, is part of this contract.
 3. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 4. Coordination and provision of any labor and materials required to meet the intent of the drawings and specifications herein, including any labor and materials from trades and suppliers other than the primary component described, are required to be provided by the Contractor as part of this contract.
 5. 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/Engineer 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 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.
- 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. See other Sections for disposition of salvaged materials that are designated as Engineer's property.

1.5 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. Engineer will return without response those RFIs submitted to Engineer by entities other than Prime Contractor.
- B. Content of the RFI: Include a detailed, legible description of item(s) needing information or interpretation and the following:
 - 1. Project name.
 - 2. Project number.
 - 3. Date.
 - 4. Name of Contractor.
 - 5. Name of Engineer
 - 6. RFI number, numbered sequentially.
 - 7. RFI subject.
 - 8. Specification Section number and title as appropriate.
 - 9. Drawing number and detail references, as appropriate.
 - 10. Field dimensions and conditions, as appropriate.
 - 11. Clarifying sketches and/or photographs as appropriate.
 - 12. Related specification, submittal, etc., paragraphs, as appropriate.
 - 13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.

- 14. Contractor's signature.
- 15. Attachments: Include sketches, descriptions, measurements, photos (include surrounding context), 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.
 - b. Include a description of attachments, including the number of pages.

C. RFI Forms: AIA Document G716.

- 1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Allow 14 days for Engineer's response for each RFI. RFIs received by Engineer after 1:00 p.m. will be considered as received the following working day.

- 1. The following Contractor-generated RFIs will be rejected:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Engineer's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
- 2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt by Engineer of additional information.
- 3. Engineer'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 a Change Proposal according to Section 01 26 00 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Engineer in writing, with detailed descriptions, within 10 days of receipt of the RFI response.

E. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.6 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 Engineer of scheduled meeting dates and times.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Engineer, within three days of the meeting.

- B. Preconstruction Conference: Conduct a preconstruction conference before starting construction, at a time convenient to Engineer, but no later than 21 days after execution of the Agreement.
1. Responsibilities and personnel assignments will be reviewed.
 2. Attendees: Authorized representatives of Engineer, 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.
 3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Preparation of record documents.
 - m. Use of the premise and existing building.
 - n. Work restrictions.
 - o. Working hours.
 - p. Engineer 's occupancy requirements.
 - q. Responsibility for temporary facilities and controls.
 - r. Procedures for moisture and mold control.
 - s. Procedures for disruptions and shutdowns.
 - t. Construction waste management and recycling.
 - u. Parking availability.
 - v. Office, work, and storage areas.
 - w. Equipment deliveries and priorities.
 - x. First aid.
 - y. Security.
 - z. Progress cleaning.
 4. Minutes: Contractor will record and distribute meeting minutes.
- C. Project Closeout Conference: A project closeout conference, at a time convenient to Engineer, but no later than 90 days prior to the scheduled date of Substantial Completion, shall be conducted.
1. Requirements and responsibilities related to Project closeout will be reviewed.
 2. Attendees: Authorized representatives of City, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.

- d. Requirements for preparing operations and maintenance data.
- e. Requirements for delivery of material samples, attic stock, and spare parts.
- f. Requirements for demonstration and training.
- g. Preparation of Contractor's punch list.
- h. Procedures for processing Applications for Payment at Substantial Completion and for Final Payment.
- i. Submittal procedures.
- j. Coordination of separate contracts.
- k. City's partial occupancy requirements.
- l. Requirements for final inspections/occupancy certification.
- m. Demobilization procedures.
- n. Installation of furniture, fixtures, and equipment.
- o. Removal of temporary facilities and controls.

Minutes: Contractor will record and distribute meeting minutes.

D. Progress Meetings: Conduct progress meetings at minimum Monthly intervals unless otherwise directed by Engineer.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Engineer, 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 the 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.
- c. Minutes: Contractor will record and distribute the meeting minutes to each party present and to parties requiring information.
- d. Schedule Updating: Revise construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Preliminary Construction Schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Submittals Schedule.
 - 4. Field condition reports
 - 5. Special reports.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Event: The starting or ending point of an activity.
- C. Major Area: A story of construction, a separate building, or a similar significant construction element.
- D. Milestone: A key or critical point in time for reference or measurement.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF electronic file.
- B. Preliminary construction schedule.
 - 1. Approval of cost-loaded, startup Construction Schedule will not constitute approval of Schedule of Values for cost-loaded activities.

- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- E. Construction Schedule Updating Reports: Submit with Applications for Payment.
- F. Site Condition Reports: Submit at time of discovery of differing conditions.
- G. Special Reports: Submit at time of unusual event.
- H. Qualification Data: For scheduling consultant.

1.5 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within 15 days of date established for commencement of the Work.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

2.2 REPORTS

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

2.3 SPECIAL REPORTS

- A. General: Submit special reports directly to Engineer within three days 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 Engineer in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. **Contractor's Construction Schedule Updating:** At each meeting or other activity where revisions have been recognized or made, update schedule to reflect actual construction progress and activities. Additionally, issue Schedule concurrent with the report of 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 Engineer, and 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 01 33 00 - SUBMITTAL PROCEDURES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

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

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Engineer'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 Engineer'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. 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.

1.4 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 revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate Submittal Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 - 2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised Submittal Schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:
- a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Engineer's final release or approval.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Engineer's Digital Data Files: Electronic digital data files of the Contract Drawings may be provided by Engineer at the request of the General Contractor and at the Engineer's approval, for Contractor's use in preparing submittals. Any costs associated with preparing these files will be assumed by the General Contractor.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. 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. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's acceptance 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 21 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer 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 21 days for review of each resubmittal. Allowing procedure in "Concurrent Consultant Review" Subparagraph below may cause tracking problems for Architect and Construction Manager, if any. Delete if not allowed. See Evaluations.
 4. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Engineer and to Engineer's consultants, allow 21 days for review of each submittal. Submittal will be returned to Engineer before being returned to Contractor.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.

2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Engineer.
 4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Engineer, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Engineer.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier.
 - h. Category and type of submittal.
 - i. Submittal purpose and description.
 - j. Specification Section number and title.
 - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.
 - o. Indication of full or partial submittal.
 - p. Transmittal number, numbered consecutively.
 - q. Submittal and transmittal distribution record.
 - r. Other necessary identification.
 - s. Remarks.
- E. Options: Identify options requiring selection by Engineer. Notes, Inquiries and other marks made by the Submit-Side (i.e. Contractor) will be done in Blue for differentiation from those made by the Engineer, which will be done in Red.
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. 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 Engineer's action stamp.
- H. 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.

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

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Submit electronic submittals via the selected Construction Project Management platform (this will most likely be BCRPs proprietary platform called *RDMS*). Types of submittals are indicated in individual Specification Sections. Generally follow the pre-populated specification sections provided by the Engineer in the platform.
 1. Submit electronic submittals as PDF electronic files.
 - a. Engineer will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 2. Action & Informational Submittals: Distribute copies of each submittal unless otherwise indicated.
 3. 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 digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each specification section, unless required otherwise by the Engineer.
 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.
- 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, but no larger than 30 by 42 inches.
 3. Submit Shop Drawings in PDF electronic file.
- 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.
 - e. Specification paragraph number and generic name of each item.
 3. Electronic Transmittal: Provide corresponding electronic PDF submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Engineer's property, are the property of Contractor.
 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

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

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.

- b. **Number of Samples:** Submit 2 sets of Samples. Architect will retain 1 Sample set; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
 - 1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit 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 indicated in the Contract Documents or assigned by Contractor if none is indicated.
 - 2. Manufacturer and product name, and model number if applicable.
 - 3. Number and name of room or space.
 - 4. Location within room or space.
 - 5. Submit product schedule as PDF electronic file.
 - F. **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 engineers, and other information specified.
 - G. **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 AWS forms. Include names of firms and personnel certified.
 - H. **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.
 - I. **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.
 - J. **Product Certificates:** Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
 - K. **Material Certificates:** Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

- L. **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.
- M. **Product Test Reports:** Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- N. **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.
- O. **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.
- P. **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.
- Q. **Field Test Reports:** Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- R. **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.
- S. **Delegated-Design**
 - 1. **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.
 - a. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.
 - 2. **Delegated-Design Certification:** In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file of certificate, signed and sealed by the responsible design professional registered in the state the project is in, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

- a. 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.
3. By agreeing to contract the services involved in Delegated Design, it is the responsibility of the contractor to work in good faith with the Engineer, in the event a Change Order, Construction Change Directive, or other official Change to the Contract affects delegated design work either already engineered or already installed to ensure both the intent of the Engineer and the continuity of the delegated design liability.

PART 3 - EXECUTION

3.1 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 Engineer.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "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.

3.2 ENGINEER'S ACTION

- A. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Engineer without action.

END OF SECTION

SECTION 01 40 00 - QUALITY REQUIREMENTS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by the Engineer or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Mockups: Full-size physical assemblies that are constructed either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances.

Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. **Integrated Exterior Mockups:** Mockups of the exterior envelope constructed on-site as indicated in-place portions of permanent construction, consisting of multiple products, assemblies, and subassemblies, with cutaways enabling inspection of concealed portions of the Work.
 - a. Include each system, assembly, component, and part of the exterior wall to be constructed for the Project. Colors of components shall be those selected by the Engineer for use in the Project.
 2. **In-Place Mockups:** Mockups constructed on-site in their actual final location as part of permanent construction.
- E. **Preconstruction Testing:** Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- F. **Product Tests:** Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. **Source Quality-Control Tests and Inspections:** Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- H. **Testing Agency:** An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" shall have the same meaning as the term "testing agency."
- I. **Quality-Assurance Services:** Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- J. **Quality-Control Services:** Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by the Engineer.

1.4 DELEGATED-DESIGN SERVICES

- A. **Performance and Design Criteria:** Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to the Engineer.
- B. **Delegated-Design Services Statement:** Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and

systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.5 CONFLICTING REQUIREMENTS

- A. **Conflicting Standards and Other Requirements:** If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Engineer regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to the Engineer for clarification 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 Engineer for a decision before proceeding.

1.6 INFORMATIONAL SUBMITTALS

- A. **Testing Agency Qualifications:** For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. **Schedule of Tests and Inspections:** Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- C. **Reports:** Prepare and submit certified written reports and documents as specified.
- D. **Permits, Licenses, and Certificates:** For Engineer's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.7 REPORTS AND DOCUMENTS

- A. **Test and Inspection Reports:** Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, telephone number, and email address of testing agency.
 - 4. Dates and locations of samples and tests or inspections.

5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
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 inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

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

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

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

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

1.8 QUALITY ASSURANCE

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. **Manufacturer Qualifications:** A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. **Fabricator Qualifications:** A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- D. **Installer Qualifications:** A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- F. **Testing and Inspecting Agency Qualifications:** An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- G. **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.
- H. **Factory-Authorized Service Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. **Mockups:** Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups of size indicated.
 2. Build mockups in location indicated or, if not indicated, as directed by the Engineer.
 3. Notify Engineer seven business days in advance of dates and times when mockups will be constructed.
 4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 6. Obtain Engineer's approval of mockups before starting corresponding Work, fabrication, or construction.
 - a. Allow seven business days for initial review and each re-review of each mockup.
 7. Promptly correct unsatisfactory conditions noted by Engineer's preliminary review, to the satisfaction of the Engineer, before completion of final mockup.
 8. Approval of mockups by the Engineer does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.
 9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 10. Demolish and remove mockups when directed unless otherwise indicated.
- J. **Integrated Exterior Mockups:** Construct integrated exterior mockup as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials. Comply with requirements in "Mockups" Paragraph.

1. Coordinate construction of the mockup to allow observation of air barrier installation, flashings, air barrier integration with fenestration systems, and other portions of the building air/moisture barrier and drainage assemblies, prior to installation of veneer, cladding elements, and other components that will obscure the work.

1.9 QUALITY CONTROL

- A. Engineer Responsibilities: Where quality-control services are indicated as Engineer's responsibility, Engineer will engage a qualified testing agency to perform these services.
 1. Engineer will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor. Charges will include minimum setup charges for that day or batch, etc.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Engineer are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor shall not employ same entity engaged by Engineer, unless agreed to in writing by Engineer.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 4. Where quality-control services are Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform duties of Contractor.
- E. **Manufacturer's Field Services:** Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- F. **Manufacturer's Technical Services:** Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. **Contractor's Associated Requirements and Services:** Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 6. Security and protection for samples and for testing and inspection equipment at Project site.
- H. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.10 SPECIAL TESTS AND INSPECTIONS

- A. **Special Tests and Inspections:** Engineer will engage a qualified testing agency to conduct Special Tests and Inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
1. Notifying Engineer and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 2. Submitting a certified written report of each test, inspection, and similar quality-control service to Engineer with copy to Contractor and to authorities having jurisdiction.
 3. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 4. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

PRODUCTS (Not Used)**PART 2 - EXECUTION****2.1 TEST AND INSPECTION LOG**

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to The Engineer.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for The Engineer's and authorities' having jurisdiction reference during normal working hours.
1. Submit log at Project closeout as part of Project Record Documents.

2.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 42 19 – GENERAL REFERENCE STANDARDS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Definitions
- B. Requirements relating to referenced standards.
- C. Reference standards full title.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Engineer'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 Engineer. 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.

END OF SECTION 01 42 19

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS**PART 1 - GENERAL****1.1 SUMMARY**

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

1.2 USE CHARGES, AND USE BY OTHER ENTITIES

- 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, Engineer's construction forces, Engineer, occupants of Project, testing agencies, and authorities having jurisdiction.

1.3 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Project Identification and Temporary Signs: Submit fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- C. Moisture-and Mold-Protection Plan: Indicate procedures and controls for protecting existing context, materials, and construction from water absorption and damage and mold.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 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 Engineer's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units, with serviceable finishes, temperature controls, and foundations adequate for normal loading, will be allowed if of a size acceptable to the Engineer.
- B. Construction Meetings: Meetings may be held on-site in the Field Office
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.2 EQUIPMENT

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

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance, also see Section 01 10 00 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Engineer, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse environmental effects including low temperatures and high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- E. Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
1. Install electric power service unless otherwise indicated.
- F. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, safety, and traffic conditions.
- G. Telephone Service: If construction site office is not provided with land-line telephone and internet service, the General Contractor's superintendent shall at a minimum carry a cell phone and have direct access to email.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
1. Maintain support facilities until Engineer schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Engineer.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction including required coordination and permitting
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated in Division 1 and Documents.
 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 3. Maintain and touch up signs so they are legible at all times.
- D. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck, cranes, and similar devices used only for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.4 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.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from Engineer and adjacent property Owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways.
1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
 2. Inspect, repair, and maintain erosion-control and sedimentation-control measures during construction until permanent vegetation has been established.
 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.
- G. Site Enclosure Fence: Prior to commencing work, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
1. Extent of Fence: As required to enclose entire Project site or portion, as shown in the Drawings, and as 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 Engineer.
- H. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.5 MOISTURE AND MOLD CONTROL

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

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

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

3.6 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. Daily construction cleanup:
 - 1. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- C. 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.
- D. Temporary Facility Changeover: Do not change over from using temporary facilities to permanent facilities until Substantial Completion or as otherwise indicated in the contract unless explicit permission is given by the Engineer in writing in advance.
- 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. Engineer reserves right to take possession of Project identification signs.
 - 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION

SECTION 01 56 39 – TEMPORARY TREE AND PLANT PROTECTION**PART 1 - GENERAL**

Refer to Standard Specification Section 31 13 13.01 and supplement with the following:

1.1 DESCRIPTION

- A. This section includes installation of the tree protection fence as shown on the Contract Drawings or as directed by the Engineer.
 - 1. Tree Preservation includes the implementation of all arboricultural activities related to tree protection and preservation of on-site existing trees. The work includes but is not limited to tree protection, fencing, pruning, root pruning, mulching, fertilization and other remedial activities. The tree protection area shall be all undisturbed areas outside of the Limit of Disturbance (LOD) and individual trees within the LOD adjacent to the proposed construction. Any tree that is designated to be saved and preserved and whose critical root zone is within, or adjacent to, the LOD will be prepared and treated to maximize their potential for survival and improve the health and condition of the tree.
 - 2. The location and quantity of root pruning and tree protection will be identified during the initial Pre Construction field walk after the Contractor has staked out the limit of disturbance for the review by the Engineer.

1.2 RELATED SECTIONS

- A. Section 32 31 23.10

PART 2 – PRODUCTS**2.1 MATERIALS**

- A. Tree Protection Fence: Use high strength polypropylene safety fence in blaze orange webbed fabric fence four feet (4') high on 2" square 6' tall standard milled lumber posts, as shown on the Contract Drawings, to provide an area of protection around the tree.

3.1 SUBMITTALS

- A. Company or Individual Qualifications to be submitted at the Pre-Construction meeting by the Contractor shall include the following:
 - 1. Contractor shall provide a State of Maryland Licensed Arborist with current certification from any of the following professional societies: the International Society of Arboriculture, the National Arborist Association (NAA) and the American Society of Consulting Arborists (ASCA).
 - 2. Verification of licensing shall be submitted at said meeting. This person shall be responsible for insuring that all work is performed to standards in a safe and professional manner but in no way alleviates the Contractor from his responsibility.

PART 4 - EXECUTION

4.1 GENERAL

- A. After the arborist has been approved by the Engineer and before the commencement of any construction activities, a Pre-Construction walk will be held. The Contractor shall be required to contact the Engineer to set up a field review meeting with the Arborist to review the locations of trees to be saved, root pruning locations, limb pruning locations and limits of disturbance. All potential conflicts between construction and preservation shall be addressed at that time.
- B. The Arborist shall be responsible for performing all arboricultural activities within the scope of this Specification. All activities will commence immediately upon notice to proceed. Activities shall be completed in a continuous manner and coordinated to prevent delay of any other construction process.
- C. The Arborist shall dedicate labor and equipment as necessary to complete the work. It shall be the responsibility of the Arborist to maintain a consistent crew on the job site in order to complete the work in a timely manner. It shall be the responsibility of the Arborist to supervise work and scheduling and see that work progresses in an efficient manner.
- D. The Arborist shall notify the Engineer of any site condition changes that may affect work progress.
- E. Erect and maintain a temporary fence around drip line (outer perimeter of branches) of individual trees or around perimeter drip line of groups of trees to remain in place, to protect against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, or smothering of trees by stockpiling construction materials. Remove fence when construction is complete. If drip line location impinges on work space revise location in consultation with Engineer.
 - 1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
 - 2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees and prevent soil compaction over root systems.
- F. Protect tree root systems from damage due to noxious materials caused by run-off or spillage while mixing, placing, or storing construction materials. Protect root systems from flooding, eroding, compaction or other conditions.
 - 1. Do not excavate within drip line of trees, unless otherwise indicated.
- G. Critical Root Zone shall be defined as one and one half foot (1.5') of radius for every inch of trunk diameter at four and one half feet (4.5') above ground level on the uphill side of the tree, or as indicated with the critical root zone symbol on the plans (a dashed line around the tree). The final limit of the Critical Root Zone shall be whichever is greater. The Contractor shall operate equipment within the root zone of trees preserved only if buffered with half inch ($\frac{1}{2}$ ") plywood and an underlying layer of six (6) inches of wood chips. Care should be given to minimize displacement of the wood chip layer when construction vehicles require tight turning radii. Rubber tired construction vehicles shall be used when working within the Critical Root Zone. Approval from the Engineer is required prior to any operation of any equipment in the tree preservation areas. Root protection measures shall be inspected and maintained throughout construction. Where the Contractor disturbs more than thirty per cent (30%) of the Critical Root Zone, this will be considered an impact to the Critical Root Zone.

- H. Root Pruning shall be performed wherever grades will be lowered within the Critical Root Zone of a tree to be preserved, in locations to be determined by the engineer. Root pruning shall be to the depth of the excavation or twenty four (24) inches whichever is less. A Vermeer RT 200 with the optional root cutter or an approved rubber tired trencher or rubber tired vibratory plow shall be used to prune roots. The blade shall be sharpened daily prior to the beginnings of all operations. A supersonic air tool shall be used when roots larger than two (2) inches in diameter are exposed to facilitate the pruning of roots or when root pruning the inner third of the critical roots of a tree. Roots with a diameter of larger than one and one half (1½) inches shall have a clean cut made on the surface of the root which is still attached to the tree. This cut shall be made with a handsaw or chain saw as soon as a larger encountered root is encountered.
- I. Backfill the root pruning trench with excavated soil and mulch. Mark the location of the trench for future reference. Backfilling shall proceed immediately following the root pruning operation. Watering of the root pruning areas shall commence immediately upon backfilling of the trench.
- J. If shown on the Plans or as directed by the Engineer, silt fences may be installed in the trench prior to backfilling as long as the trench is not open for longer than forty eight (48) hours without watering.
- K. Root pruning shall not be undertaken when more than the top one (1) inch of soil is frozen. Root pruning shall not be undertaken when the soil is wet and conditions are muddy.
- L. Do not damage trees or vegetation indicated to remain. Should such damage occur, the Contractor will be responsible to repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner acceptable to the Owner and approved by Engineer.
 - 1. Employ a qualified arborist, licensed in State of Maryland, to submit details of proposed repairs and to repair damage to trees and shrubs.
 - 2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

4.2 TREE REPAIR AND REPLACEMENT

- A. Avoid damage to remaining trees during construction operations.
- B. If damage occurs, do not prune remaining trees. Notify Engineer immediately. Make necessary repairs as follows:
 - 1. Promptly repair trees damaged by construction operations within twenty-four (24) hours as directed by Engineer. Treatment of damaged trunks, limbs and roots must be undertaken by a qualified arborist.
 - 2. The Contractor shall restore, to the satisfaction of the Department of Recreation and Parks any trees that have been damaged or destroyed at no additional cost of the City. Contractor shall also be responsible for any fines levied as per Article 7, Division IV City Code- Forest and Tree Preservation.
 - 3. Replacement trees shall be planted within the limits of the project whenever necessary, as determined by the Department of Recreation and Parks. If not possible, a suitable location will be determined by the Engineer.

4. If any tree is severely damaged it must be replaced. Provide replacement trees of five to six inch (5"-6") caliper size and of the species selected by the Engineer.
5. If necessary, aerate surface soil compacted during construction from ten feet (10') beyond the drip line to no closer than thirty-six inches (36") from the tree trunk. Drill one inch (1") diameter holes a minimum of twelve inches (12") deep at twenty-four inches (24") on center in all directions from the tree trunk. Backfill holes with sharp sand.

END OF SECTION 01 56 39

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 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.

1.2 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.
 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.

1.3 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. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Engineer will notify Contractor of approval or rejection of proposed comparable product request within 21 days of receipt of request, or 7 business days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Section 01 33 00 "Submittal Procedures."
 - b. Use product specified if Engineer 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 01 33 00 "Submittal Procedures." Show compliance with requirements.

1.4 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.

1.5 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. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to 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. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions including temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.6 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 Engineer.
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. **Specified Form:** When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
- C. **Submittal Time:** Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 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. Engineer 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," Engineer will make selection.
 - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 - 6. Refer to Section 01-81-13.33 Sustainable Design Requirements for additional product requirements.
- B. **Product Selection Procedures:**
 - 1. **Product:** Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - 2. **Manufacturer/Source:** Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - 3. **Products:**
 - a. **Restricted List:** Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - b. **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.
 - 4. **Manufacturers:**
 - a. **Restricted List:** Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.

- Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
- b. **Nonrestricted List:** Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
5. **Basis-of-Design Product:** Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. **Visual Matching Specification:** Where Specifications require "match Engineer's sample", provide a product that complies with requirements and matches Engineer's sample. Engineer's decision will be final on whether a proposed product matches.
 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.
 - D. **Visual Selection Specification:** Where Specifications include the phrase "as selected by Engineer from manufacturer's full range" or similar phrase, select a product that complies with requirements. Engineer will select color, gloss, pattern, density, or texture from manufacturer's product line.

2.2 COMPARABLE PRODUCTS

- A. **Conditions for Consideration:** Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Engineer 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 engineers, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 73 00 - EXECUTION**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 general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Installation of the Work.
 - 3. Coordinating installations.
 - 4. Cutting and patching.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work
- B. Related Requirements:
 - 1. Section 01 10 00 "Summary" for limits on use of Project site.
 - 2. Section 01 33 00 "Submittal Procedures" for submitting surveys.
 - 3. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Engineer-accepted deviations from indicated lines and levels, and final cleaning.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.
- C. Cutting and Patching Plan: Submit plan describing procedures at least 8 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 length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems. See 01 50 00.

1.5 QUALITY ASSURANCE

- A. 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 Engineer of locations and details of cutting and await directions from Engineer before proceeding. Shore, brace, and support structural elements 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. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Thermal barriers and insulation.
 - e. Fire-suppression systems.
 - f. Mechanical systems piping and ducts.
 - g. Control systems.
 - h. Communication systems.
 - i. Fire-detection and -alarm systems.
 - j. Conveying systems.
 - k. Electrical wiring systems.
 - l. Operating systems of special construction.
 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their 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. Exterior envelope.
 - c. Membranes and flashings.
 - d. Exterior curtain-wall construction.

- e. Sprayed fire-resistive material.
 - f. Equipment supports.
 - g. Piping, ductwork, vessels, and equipment.
 - h. 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 Engineer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- B. Cutting and Patching Conference: If requested by Engineer, before proceeding, meet at Project site with all 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.
- C. Remove and replace per code any existing items, components, products, and finishes required to complete execution of the specified elements of the Contract per code and per manufacturer's requirements.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 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, or should not, be used, use materials that, when installed, will provide a match acceptable to Engineer for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 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 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.
 3. Refer to the Excavating, Filling, and Grading to section 312300

- 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. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. **Written Report:** Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
1. Description of the Work.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. **Existing Utility Information:** Furnish information to local utility and Engineer 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 Contractor, submit a Request for Information to Engineer according to requirements in Section 01 31 00 "Project Management and Coordination."

3.3 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 Engineer promptly.
- B. **Site Improvements:** Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

- C. **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.
- D. **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 Engineer and Construction Manager.

3.4 INSTALLATION

- A. **General:** Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches 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. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. **Tools and Equipment:** Do not use tools or equipment that produce harmful noise levels.
- G. **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.
- H. **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 Engineer.
 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.
 4. Attach/Install all project components, at a minimum, per manufacturer's requirements.

- I. Should any Work or material be required which is not noted in the Contract Documents either directly or indirectly, but which is nevertheless, necessary for the proper carrying out of the intent thereof, it is understood and agreed that the Contractor shall perform all such Work and furnish all such materials as fully as if they were completely delineated and prescribed at no additional cost or expense to the City.
- J. 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.
- K. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 - 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 "Construction Waste Management and Disposal."

- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.6 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 Section 01 40 00 "Quality Requirements."

3.7 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.

END OF SECTION

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**PART 1 GENERAL****1.1 SUMMARY**

- A. Reduce construction and demolition waste on project site and minimize waste sent to landfills and incineration through implementation of a Construction and Demolition Waste Management Plan as required by 2018 International Green Construction Code as amended by Baltimore City and as outlined within this section. Throughout this section, the term IgCC is used in place of International Green Construction Code.

1.2 WASTE MANAGEMENT REQUIREMENTS

- A. Engineer requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
- E. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.
- F. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- G. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.3 PRELIMINARY SUBMITTALS

- A. Prior to any waste removal and within 30 days of Contract award, submit for approval a detailed Waste Management Plan in accordance with IgCC requirements and as outlined in this Section.
- B. Describe means and methods to achieve required goal.

1.4 INFORMATIONAL SUBMITTALS

- A. With each Application for Payment, submit waste management progress reports, demonstrating
1. Project title, name of party completing report, and dates of period covered by the report.
 2. Option 1: Amount (by weight or volume) of recycled and/or salvaged construction and demolition waste to date, include the identified four material streams.
 - a. Exclude excavated soil, land-clearing waste from calculations.
 - b. Include materials destined for alternative daily cover (ADC) as landfilled waste.
 - c. Include wood waste converted to fuel (biofuel) or waste-to-energy as diverted from landfill in calculations.
 - 1) Exclude all other types of waste-to-energy from calculations.
 - d. Comingling sorting facilities: Provide summary of diversion rates, type of materials recycled and description of the end destination of the recycled materials.
 3. Option 2: Calculate waste generated per square foot of building floor area.
 - a. Exclude materials reused on site.
 - b. Include all materials donated, sent to reuse facility or reused off-site.
 - c. Include all materials sent to recycling facilities, landfills and incinerators.

1.5 CLOSEOUT SUBMITTALS

- A. Waste Management Plan: Include the following information:
1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
 2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
 4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
 5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
 6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

- B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 2. Submit Report on a form acceptable to Engineer.
 3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 4. Incinerator Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
 - c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 5. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
 6. Material Reused on Project: Include the following information for each:
 - a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards.
 - c. Include weight tickets as evidence of quantity.
 7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS (NOT USED)**PART 3 EXECUTION****3.1 WASTE MANAGEMENT PLAN IMPLEMENTATION**

- A. Training and Coordination:
 - 1. Furnish copies of approved Waste Management Plan to all on-site supervisors, each subcontractor, and Engineer.
 - 2. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all entities at the appropriate stages of the Project.
 - 3. Meetings: Include construction waste management on the agenda of all required regularly scheduled construction meetings.
- B. Facilities: Provide designated facilities for co-mingling or separation and storage of materials for recycling, salvage, reuse, return, donation and waste disposal, per approved Waste Management Plan for use by all contractors and installers.
 - 1. Provide adequate space, convenient to subcontractors, for pick-up and delivery.
 - 2. Keep recycling and waste bin areas neat and clean to avoid contamination of materials.
- C. Records: Maintain on-site logs for each load of materials removed from site:
 - 1. Include type of material, load (by weight or volume), recycling/hauling service, and date accepted by service or non-profit receiver.
 - a. Comingling waste as a single stream: provide documentation of percentages of diverted waste from the sorting facility for the corresponding month.
 - b. Comingled waste as multiple streams: provide documentation of percentages of individual waste streams based on weight or volume.
- D. Methods of waste disposal that are not acceptable for IgCC compliance:
 - 1. Burning or incinerating on or off project site, except as described in PART 1 of this section.
 - 2. Burying on project site, other than fill.
 - 3. Dumping or burying on other property, public or private, other than official landfill.
 - 4. Illegal dumping or burying.
- E. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

- F. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Engineer, and Engineer.
- G. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- H. Meetings: Discuss trash/waste management goals and issues at project meetings, particularly at:
 - 1. Prebid meeting.
 - 2. Preconstruction meeting.
 - 3. Regular job-site meetings.
- I. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

END OF SECTION

SECTION 01 77 00 - CLOSEOUT PROCEDURES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion (*a.k.a. Conditional Acceptance*) procedures.
 - 2. Final Completion procedures. (*a.k.a. Final Acceptance*)
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.

1.2 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.3 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

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

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Additional requirements from the Standard Specifications (see "Special Provisions" section), in which "Substantial Completion" is referred to as "Conditional Acceptance", will apply.

- B. Contractor's List of Incomplete Items: Prepare and submit a *List of Incomplete Items* (to be completed and corrected) a.k.a. *Contractor's punch list*, indicating the value of each item on the list and reasons why the Work is incomplete.
- C. Submittals Prior to Substantial Completion: Complete the following a minimum of 14 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Engineer unrestricted use of the Work and access to services and utilities. Include Occupancy Permits, operating certificates, and similar releases.
 2. Submit Closeout Submittals specified in other Division 01 Sections, including project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit Maintenance Material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Engineer. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit Schedule of Maintenance Material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Engineer's signature for receipt of submittals.
 5. Submit test records.
 6. Submit changeover information related to Engineer 's Use & Occupancy, operation, and maintenance.
- D. Procedures Prior to Substantial Completion: Complete the following a minimum of 14 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Engineer of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Engineer. Advise Engineer's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Engineer's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 6. Advise Engineer of changeover in heat and other utilities.
 7. Participate with Engineer in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements, including touchup painting.
 10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
 11. Provide proof of scheduling initial Use and Occupancy inspection?
- E. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 14 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after

inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, 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.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.7 FINAL COMPLETION PROCEDURES

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

1. Submit a final Application for Payment according to Section 01 29 00 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 14 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer 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.

1.8 LIST OF INCOMPLETE ITEMS (CONTRACTOR'S PUNCH LIST)

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

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding to indoor spaces.
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 Engineer.
 - d. Name of Contractor.
 - e. Page number.
4. Submit *List of Incomplete Items* in an Excel spreadsheet digital format. List of spaces will correspond with Tabs in Excel. Each item shall include CSI division association for cross-reference by trade.

5. The absence of items on the punch list and/or failure of engineer to identify items not included on the list shall in no way relieve contractor from completing the Work in the Documents.

1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Engineer 's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 21 days of completion of designated portions of the Work that are completed and occupied or used by Engineer during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 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. Warranty Electronic File: 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 bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

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

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

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

- a. Clean Project site, 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. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
- j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
- k. Remove labels that are not permanent.
- l. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
- p. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
- q. Clean strainers and grills.
- r. Leave Project clean and ready for occupancy.

C. **Pest Control:** Comply with pest control requirements in Section 01 50 00 "Temporary Facilities and Controls." Prepare written report.

D. **Construction Waste Disposal:** Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

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

- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, etc.
 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 01 78 23 – OPERATION AND MAINTENANCE DATA**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
1. Operation and maintenance documentation directory manuals.
 2. Systems and equipment operation manuals.
 3. Systems and equipment maintenance manuals.
 4. Product maintenance manuals.

1.2 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 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. Engineer will comment on whether content of operations and maintenance submittals are acceptable.
 2. Where applicable, clarify and update reviewed manual content to correspond to revisions 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 Engineer.
 - 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. Operations manual: Provide 3. Include a complete operation and maintenance directory. For printed version 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. Engineer and Commissioning Authority will review and 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. Engineer will return copy with comments.
1. Correct or revise each manual to comply with Engineer's comments. Submit copies of each corrected manual within 14 days of receipt of Engineer's comments and prior to commencing demonstration and training.

1.4 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
 2. Table of contents.
 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 Engineer.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for Construction Manager.
 7. Name and contact information for Engineer.
 8. Name and contact information for Commissioning Authority.
 9. Names and contact information for major consultants to the Engineer that designed the systems contained in the manuals.
 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

PART 2 - PRODUCTS**2.1 EMERGENCY MANUALS**

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Engineer's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- C. 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. Water leak.
 - 4. Power failure.
 - 5. Water outage.
 - 6. System, subsystem, or equipment failure.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Engineer 's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- E. 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.

2.2 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
- B. 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 has 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.

C. 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.

D. 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.

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

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

2.3 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

B. 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 warranties and bonds, as described below.

C. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; 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.

- a. 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.
 - 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.
- 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. **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.
- H. **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.

2.4 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.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. 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.
- D. 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 Section 01 78 39 "Project Record Documents."

- E. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 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.

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
1. Number of Copies: Submit 1 set of marked-up record prints.
 2. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit 1 paper-copy set of marked-up record prints.
 - 2) Submit PDF electronic files of scanned record prints and file prints.
 - 3) Submit record digital data files and 1 set of plots.
 - 4) Engineer will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit 1 paper-copy set of marked-up record prints.
 - 2) Submit PDF electronic files of scanned record prints.
 - 3) Include each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit into Construction Management Platform (*RDMS*) written report biweekly indicating items incorporated into project record documents concurrent with progress of

the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS and SPECIFICATIONS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, as well as Specifications Book, incorporating new and revised drawings and specifications as modifications are issued.
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.
 - 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 Engineer'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, Shop Drawings, and Specifications completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record sets (including Specifications) 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, including Specifications.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2.2 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 annotated PDF electronic file.
 1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.3 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file.
 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. 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 Engineer's reference during normal working hours.

END OF SECTION

SECTION 01 81 13.33 - SUSTAINABLE DESIGN REQUIREMENTS - IGCC/ASHRAE 189.1**PART 1 GENERAL****1.1 SUMMARY**

- A. Section includes general requirements and procedures for compliance with certain International Green Construction Code powered by ASHRAE 189.1 (IgCC/ASHRAE 189.1) requirements.
1. Other IgCC/ASHRAE 189.1 requirements depend on product selections and may not be specifically identified as IgCC/ASHRAE 189.1 requirements. Compliance with IgCC/ASHRAE 189.1 requirements will be used as one criterion to evaluate substitution requests and comparable product requests.

1.2 DEFINITIONS

- A. IgCC/ASHRAE 189.1: International Green Construction Code powered by ASHRAE 189.1.
1. Definitions that are a part of the IgCC/ASHRAE 189.1 apply to this Section.
- B. Recycled Content: Building product recycled content is determined as postconsumer content plus one half preconsumer recycled content, based on weight. The recycled fraction is then multiplied by the cost of the product or assembly.
- C. Salvaged Material Content: Building product salvaged content is determined by the actual cost of the salvaged material or the cost of a comparable alternative component material.
- D. Recyclable Building Materials and Building Components: Materials and components that can be recycled into the same or another material with a recovery rate of not less than 50 percent or that are recyclable through an established, nationally available, closed-loop manufacturer's take-back program.
- E. Bio-Based Materials: Building products that meet one of the following requirements:
1. Materials that comply with the minimum biobased contents of the USDA's BioPreferred Program.
 2. Materials that contain the USDA-certified Biobased Product label.
 3. Materials composed of solid wood, engineered wood, bamboo, wool, cotton, cork, agricultural fibers, or other biobased materials with at least 50% bio-based content.
 4. Wood and wood products that contain not less than 60% wood content tracked by a chain-of-custody process and documented and certified in accordance with principles, standards, and criteria developed using ISO/IEC Guide 59 or the WTO Agreement on Technical Barriers to Trade.
- F. Regional Materials: Building materials that are composed of materials and products that are manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site. If materials are transported by rail or water, multiply the distance transported

by rail or water by 0.25 to determine the distance to the Project site. If only a portion of a material or product complies with this requirement, only that portion contributes to regional compliance.

- G. Multiple-Attribute Product Declaration or Certification: A minimum of 10 different products installed in the Project comply with one of the following:
1. Type III Industry-Wide Environmental Product Declaration consistent with ISO 14025 and ISO 21930 and minimum cradle-to-gate scope.
 2. Type III Product-Specific Environmental Product Declaration complying with the goal and scope for the cradle-to-gate requirements in accordance with ISO 14025 and ISO 21930.
 3. Material-Specific Third-Party Multi-Attribute Certification in Accordance with One of the Following Standards:
 - a. BIFMA e3.
 - b. NSF/ANSI 140.
 - c. NSF/ANSI 332.
 - d. NSF/ANSI 336.
 - e. NSF/ANSI 342.
 - f. NSF/ANSI 347.
 - g. ANSI/NSC 373.
 - h. ANSI A138.1.
 - i. UL 100.
 - j. UL 102.
 4. Third-party critical review of product life-cycle assessment in compliance with ISO 14040 and ISO 14044.
- H. Performance Option: Perform life-cycle assessment in accordance with ASTM E2921 and ISO 14044.

1.3 REFERENCE STANDARDS

- A. ANSI A138.1 - Green Squared-American National Standard Specifications for Sustainable Ceramic Tiles, Glass Tiles, and Tile Installation Materials.
- B. ANSI/NSC 373 - Sustainable Production of Natural Dimension Stone.
- C. ASTM D5197 - Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air (Active Sampler Methodology).
- D. ASTM D5466 - Standard Test Method for Determination of Volatile Organic Compounds in Atmospheres (Canister Sampling Methodology).
- E. ASTM D6007 - Standard Test Method for Determining Formaldehyde Concentrations in Air from Wood Products Using a Small-Scale Chamber.
- F. ASTM D6196 - Standard Practice for Choosing Sorbents, Sampling Parameters and Thermal Desorption Analytical Conditions for Monitoring Volatile Organic Chemicals in Air.
- G. ASTM D6345 - Standard Guide for Selection of Methods for Active, Integrative Sampling of Volatile Organic Compounds in Air.

- H. ASTM E1333 - Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.
- I. ASTM E2921 - Standard Practice for Minimum Criteria for Comparing Whole Building Life Cycle Assessments for Use with Building Codes, Standards, and Rating Systems.
- J. BIFMA e3 - Furniture Sustainability Standard; Business and Institutional Furniture Manufacturers Association.
- K. ISO 14025 - Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures.
- L. ISO 14040 - Environmental management - Life cycle assessment - Principles and framework.
- M. ISO 14044 - Environmental management - Life cycle assessment - Requirements and guidelines.
- N. ISO 21930 - Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services.
- O. ISO 7708 - Air quality — Particle Size Fraction Definitions for Health-Related Sampling.
- P. NSF/ANSI 140 - Sustainability Assessment for Carpet.
- Q. NSF/ANSI 332 - Sustainability Assessment for Resilient Floor Coverings.
- R. NSF/ANSI 336 - Sustainability Assessment for Commercial Furnishings Fabric.
- S. NSF/ANSI 342 - Sustainability Assessment for Wallcovering Products.
- T. NSF/ANSI 347 - Sustainability Assessment for Single Ply Roofing Membranes.
- U. UL 100 - Standard for Sustainability for Gypsum Boards and Panels.
- V. UL 102 - Sustainability Assessment for Swinging Door Leafs.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site. Review IgCC/ASHRAE 189.1 requirements and action plans for meeting requirements.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Respond to questions and requests from Engineer regarding IgCC/ASHRAE 189.1 requirements that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures. Document responses as informational submittals.

1.6 ACTION SUBMITTALS

- A. General: Submit additional sustainable design submittals required by other Specification Sections.

- B. Sustainable design submittals are in addition to other submittals.
1. If submitted item is identical to that submitted to comply with other requirements, include an additional copy with other submittal as a record copy of compliance with indicated IgCC/ASHRAE 189.1 requirements instead of separate sustainable design submittal. Mark additional copy "Sustainable design submittal."
- C. IgCC/ASHRAE 189.1 Documentation Submittals:
1. Material Selection: Product Data for salvaged, recycled, recyclable, bio-based, and regional materials showing compliance with requirements. Tabulate cost for building materials used in the Project and indicate those that are salvaged, recycled, recyclable, bio-based, or regional. Include summary of building materials tabulation, showing compliance with requirement and the following:
 - a. Receipts for salvaged materials, indicating sources and mass, volume, or cost as applicable.
 - b. Product Data and certification letter from product manufacturers for recyclable materials. Include statement indicating cost.
 - c. Product Data and certification letter from product manufacturers indicating percentage by weight of recycled content for products having recycled content. Include statement indicating cost.
 - d. Product Data and certification letter from product manufacturers for bio-based materials. Include chain-of-custody certificates for products containing certified wood. Include statement indicating cost.
 - e. Product Data for indigenous materials indicating location of material manufacturer and point of extraction, harvest, or recovery for raw materials. Include statement indicating distances from Project site, modes of transportation, and cost.
 2. Construction Waste Management: Comply with Section 01 7419 "Construction Waste Management and Disposal."
 3. Indoor-Air Quality (IAQ) During Construction:
 - a. Construction IAQ management plan.
 - b. Product Data for temporary filtration media.
 - c. Product Data for filtration media used during occupancy.
 4. Material Emissions and Pollutant Control: Product Data for the following, indicating compliance with requirements:
 - a. Composite wood products.
 - b. Adhesives and sealants.
 - c. Paints and coatings.
 - d. Flooring.
 - e. Acoustical ceilings and wall systems.
 - f. Insulation.

1.7 INFORMATIONAL SUBMITTALS

- A. Action Plans: Submit the following action plans within seven days of date established for commencement of the Work, indicating how requirements will be met.
1. Material Selection Plan: List of proposed materials. Tabulate anticipated mass, volume, or cost for proposed building materials and indicate those that are used,

recycled, recyclable, bio-based, or indigenous. Include summary of proposed building materials tabulation, showing compliance with requirement.

2. Waste management plan complying with Section 01 7419 "Construction Waste Management and Disposal."
 3. Material Emissions and Pollutant Control Plan: List of proposed products. Indicate each product that complies with criteria, each product that does not, and anticipated quantities of each that will be used. Include calculations showing that percentage of noncompliant products will not exceed allowable limit.
 4. Construction IAQ management plan.
- B. Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction activities with action plans.
- C. IAQ test report.

PART 2 PRODUCTS

2.1 MATERIALS, GENERAL

- A. Provide products and procedures necessary to comply with requirements in this Section for material selection and for material emissions and pollutant control. Although other Sections may specify some requirements for material selection and for material emissions and pollutant control, the Contractor provides additional materials and procedures necessary to comply with requirements.

2.2 MATERIAL EMISSIONS AND POLLUTANT CONTROL

- A. Composite Wood Products: Formaldehyde emission rates not greater than the following when tested according to ASTM D6007 or ASTM E1333.
1. Hardwood Plywood: 0.05 ppm.
 2. Particleboard: 0.09 ppm.
 3. Medium-Density Fiberboard More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.
 4. Medium-Density Fiberboard 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
- B. Adhesives and Sealants Inside the Weatherproofing System: Comply with either of first two subparagraphs below:
1. Comply with VOC emissions requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Do not exceed formaldehyde emissions of 16.5 micrograms/cu. m or 13.5 ppb, whichever is less.
 2. Do not exceed VOC content limits of authorities having jurisdiction and the following:
 - a. Carpet Adhesives: 50 g/L.
 - b. Carpet Pad Adhesives: 50 g/L.

- c. Wood Flooring Adhesive: 100 g/L.
- d. Rubber Floor Adhesives: 60 g/L.
- e. Subfloor Adhesives: 50 g/L.
- f. Ceramic Tile Adhesives: 65 g/L.
- g. VCT and Asphalt Tile Adhesives: 50 g/L.
- h. Gypsum Board and Panel Adhesives: 50 g/L.
- i. Cove Base Adhesives: 50 g/L.
- j. Multipurpose Construction Adhesives: 70 g/L.
- k. Structural Glazing Adhesives: 100 g/L.
- l. Single-Ply Roof Membrane Adhesive: 250 g/L.
- m. Architectural Sealants: 250 g/L.
- n. Sealant Primers for Nonporous Substrates: 250 g/L.
- o. Sealant Primers for Porous Substrates: 775 g/L.
- p. Modified Bituminous Sealant Primers: 500 g/L.
- q. Other Sealant Primers: 750 g/L.
- r. CPVC Welding Compounds: 490 g/L.
- s. PVC Welding Compounds: 510 g/L.
- t. ABS Welding Compounds: 325 g/L.
- u. Plastic Cement Welding Compounds: 250 g/L.
- v. Adhesive Primer for Plastic: 550 g/L.
- w. Contact Adhesive: 80 g/L.
- x. Special-Purpose Contact Adhesives (Contact Adhesives That Are Used to Bond Melamine-Covered Board, Metal, Unsupported Vinyl, Rubber, or Wood Veneer 1/16 Inch or Less in Thickness to Any Surface): 250 g/L.
- y. Structural Wood Member Adhesives: 140 g/L.

C. Field Paints and Coatings Inside the Weatherproofing System: Comply with either of the following for VOC emissions:

1. The requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 micrograms/cu. m or 13.5 ppb, whichever is less.
2. Do not exceed VOC content limits of authorities having jurisdiction and the following:
 - a. Flat Coatings: 50 g/L.
 - b. Nonflat Coatings: 100 g/L.
 - c. Nonflat - High Gloss Coatings: 150 g/L.
 - d. Basement Special Coatings: 400 g/L.
 - e. Bond Breakers: 350 g/L.
 - f. Concrete Curing Compounds: 350 g/L.
 - g. Concrete/Masonry Sealers: 100 g/L.
 - h. Dry-Fog Coatings: 150 g/L.
 - i. Faux Finishing Coatings: 350 g/L.
 - j. Fire-Resistive Coatings: 350 g/L.
 - k. Floor Coatings: 100 g/L.
 - l. Form-Release Compounds: 250 g/L.
 - m. Graphic Arts Coatings (Sign Paints): 500 g/L.
 - n. High-Temperature Coatings: 420 g/L.
 - o. Industrial Maintenance Coatings: 250 g/L.
 - p. Low-Solids Coatings: 120 g/L.
 - q. Magnesite Cement Coatings: 450 g/L.
 - r. Mastic Texture Coatings: 100 g/L.
 - s. Metallic Pigmented Coatings: 500 g/L.

- t. Multicolor Coatings: 250 g/L.
 - u. Pretreatment Wash Primers: 420 g/L.
 - v. Primers, Sealers, and Undercoaters: 100 g/L.
 - w. Reactive Penetrating Sealers: 350 g/L.
 - x. Recycled Coatings: 250 g/L.
 - y. Rust-Preventive Coatings: 250 g/L.
 - z. Shellacs, Clear: 730 g/L.
 - aa. Shellacs, Pigmented: 550 g/L.
 - ab. Stains: 250 g/L.
 - ac. Swimming Pool Coatings: 340 g/L.
 - ad. Tub and Tile Refinish Coatings: 420 g/L.
 - ae. Waterproof Membranes: 250 g/L.
 - af. Wood Coatings: 275 g/L.
 - ag. Wood Preservatives: 350 g/L.
 - ah. Zinc-Rich Primers: 340 g/L.
- D. Flooring: Comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 micrograms/cu. m or 13.5 ppb, whichever is less. Where postmanufactured coatings or applications have not been applied, concrete, ceramic and concrete tile, clay and concrete pavers, metal, and organic-free, mineral-based flooring complies with this requirement.
- E. Acoustical Ceilings: Comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 micrograms/cu. m or 13.5 ppb, whichever is less.
- F. Wall Systems: Comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 micrograms/cu. m or 13.5 ppb, whichever is less. Where postmanufactured coatings or applications have not been applied, concrete, concrete masonry, clay masonry, gypsum plaster, ceramic and concrete tile, metal, and organic-free, mineral-based materials comply with this requirement.
- G. Insulation: Comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 16.5 micrograms/cu. m or 13.5 ppb, whichever is less, except for insulation manufactured without formaldehyde.

PART 3 EXECUTION

3.1 NONSMOKING BUILDING

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

3.2 CONSTRUCTION WASTE MANAGEMENT

- A. Comply with Section 01 7419 "Construction Waste Management and Disposal."

3.3 CONSTRUCTION IAQ MANAGEMENT

- A. Cover or close openings in ducts and other related air-distribution component openings with tape, plastic, sheet metal, or other approved method before beginning dust-producing operations, and maintain until dust-producing operations are complete.
- B. Provide temporary ventilation during construction, using one or more of the following methods:
 - 1. Natural ventilation complying with the IBC.
 - 2. Fans that produce three air changes per hour.
 - 3. Exhaust in work areas at not less than 0.05 cfm/sq. ft. (0.24 L/sq. m) and not less than 10 percent greater than supply air to maintain a negative pressure.
- C. Air-Quality Testing: Engage testing agency to perform the following:
 - 1. Conduct baseline IAQ testing, after construction ends and prior to occupancy, using testing protocols in accordance with ASTM D5197, ASTM D5466, ASTM D6196, ASTM D6345, and ISO 7708. A minimum of one sampling point per 25,000 sq. ft. or contiguous floor area is required.
 - 2. Concentrations of the following shall not exceed the following:
 - a. Particulates (PM2.5): 35 micrograms/cu. m. (24 h)
 - b. Particulates (PM10): 150 micrograms/cu. m. (24 h)
 - c. Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.
 - d. 1, 1, 1-Trichloroethane: 1000 micrograms/cu. m.
 - e. 1, 3-Butadiene: 20 micrograms/cu. m.
 - f. 1, 4-Dichlorobenzene: 800 micrograms/cu. m.
 - g. 1, 4-Dioxane: 3000 micrograms/cu. m.
 - h. 2-Propanol: 7000 micrograms/cu. m.
 - i. Acetaldehyde: 140 micrograms/cu. m.
 - j. Acrylonitrile: 5 micrograms/cu. m.
 - k. Benzene: 60 micrograms/cu. m.
 - l. t-Butyl Methyl Ether: 8000 micrograms/cu. m.
 - m. Carbon Disulfide: 800 micrograms/cu. m.
 - n. Carbon Tetrachloride: 40 micrograms/cu. m.
 - o. Chlorobenzene: 1000 micrograms/cu. m.
 - p. Chloroform: 300 micrograms/cu. m.
 - q. Dichloromethene: 400 micrograms/cu. m.
 - r. Ethylbenzene: 2000 micrograms/cu. m.
 - s. Ethylene Glycol: 400 micrograms/cu. m.
 - t. Formaldehyde: 33 micrograms/cu. m.
 - u. n-Hexane: 7000 micrograms/cu. m.
 - v. Naphthalene: 9 micrograms/cu. m.
 - w. Phenol: 200 micrograms/cu. m.
 - x. Styrene: 900 micrograms/cu. m.
 - y. Tetrachloroethane: 35 micrograms/cu. m.
 - z. Toluene: 300 micrograms/cu. m.
 - aa. Trichloroethane: 600 micrograms/cu. m.
 - ab. Xylene Isomers: 700 micrograms/cu. m.

- ac. Total Volatile Organic Compounds: 500 micrograms/cu. m.
3. Where carpets and fabrics with styrene butadiene rubber latex backing are installed, the following are the maximum allowable concentrations:
- a. 1-Methyl-2-Pyrrolidinone: 160 micrograms/cu. m.
 - b. 2-Ethylhexanoic Acid: 25 micrograms/cu. m.
 - c. 4-Phenylcyclohexene (4-PH): 2.5 micrograms/cu. m.
 - d. Caprolactam: 100 micrograms/cu. m.
 - e. Nonanal: 13 micrograms/cu. m.
 - f. Octanal: 7.2 micrograms/cu. m.
4. For each sampling point where the maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to indicate that requirements are achieved. Repeat procedure until all requirements have been met. When retesting noncomplying building areas, take samples from same locations as in the first test.
5. If any maximum concentration limit is exceeded and not mitigated and successfully retested, the building shall be flushed out for 14 days with air-handling units at maximum outside air while maintaining a temperature of at least 60 deg F (15.6 deg C) and a relative humidity of not more than 60 percent.

END OF SECTION

SECTION 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS**PART 1 GENERAL****1.1 SUMMARY**

- A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components. Commissioning shall be in accordance with the Building, Fire and Related Codes of Baltimore City.
- B. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
 - 1. Verify that the work is installed in accordance with the Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
 - 2. Verify and document that functional performance is in accordance with the Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
 - 3. Verify that operation and maintenance manuals submitted to Engineer are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
 - 4. Verify that the Engineer's operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.
- C. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.
- D. The Commissioning Authority is required to respond to commissioning requests from the Code Official and to coordinate required commissioning for the Project, including the creation of reports and retention records, as required by the authorities having jurisdiction and applicable local codes, including IgCC as amended by the Building, Fire and Related Codes of Baltimore City.
 - 1. The Commissioning Authority must keep record of the commissioning required by IgCC and furnish reports as required by the City, on request, to the Code Official.
- E. The Commissioning Authority is employed by Contractor on behalf of Engineer.

1.2 SCOPE OF COMMISSIONING

- A. The following are to be commissioned:
- B. All systems required by the IgCC as amended by the Building, Fire and Related Codes of Baltimore City, whether listed below or not.
- C. Building envelope:
 - 1. Air tightness.

- D. Plumbing Systems:
 - 1. Water heaters.
 - 2. Booster pumps.
- E. HVAC System, including:
 - 1. Major and minor equipment items.
 - 2. Piping systems and equipment.
 - 3. Ductwork and accessories.
 - 4. Terminal units.
 - 5. Control system.
- F. Electrical Systems:
 - 1. Lighting controls other than manual switches.
- G. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

1.3 REFERENCE STANDARDS

- A. International Green Construction Code, 2018 edition as adopted by Baltimore City.

1.4 SUBMITTALS

- A. Product Data: If submittals to Engineer do not include the following, submit copies as soon as possible:
 - 1. Manufacturer's product data, cut sheets, and shop drawings.
 - 2. Manufacturer's installation instructions.
 - 3. Startup, operating, and troubleshooting procedures.
 - 4. Fan and pump curves.
 - 5. Factory test reports.
 - 6. Warranty information, including details of Engineer's responsibilities in regard to keeping warranties in force.
- B. Manufacturers' Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.
- C. Startup Plans and Reports.
- D. Completed Prefunctional Checklists.

- E. Commissioning Issues Log

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

- A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Engineer.
- B. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
 - 1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F and resolution of plus/minus 0.1 degree F.
 - 2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
 - 3. Calibration: According to the manufacturer's recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.
- C. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Engineer; such equipment, tools, and instruments are to become the property of Engineer.
- D. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.
 - 1. Dataloggers required to for Functional Tests will be provided by the Commissioning Authority and will not become the property of Engineer.

PART 3 EXECUTION

3.1 COMMISSIONING PLAN

- A. Commissioning Authority will prepare the Commissioning Plan.
 - 1. Attend meetings called by the Commissioning Authority for purposes of completing the commissioning plan.
 - 2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.
- B. Contractor is responsible for compliance with the Commissioning Plan.
- C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.

- D. Commissioning Schedule:
1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Authority within 60 days after award of Contract.
 2. Re-submit anticipated startup dates whenever revised, but not less than 4 weeks prior to startup.
 3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
 4. Provide sufficient notice to Commissioning Authority for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.2 DOCUMENTATION IDENTIFICATION SYSTEM

- A. Give each submitted form or report a unique identification; use the following scheme.
- B. Type of Document: Use the following prefixes:
1. Startup Plan: SP-.
 2. Startup Report: SR-.
 3. Prefunctional Checklist: PC-.
 4. Functional Test Procedure: FTP-.
 5. Functional Test Report: FTR-.
- C. System Type: Use the first 4 digits from CSI/CSC MF (Master Format), that are applicable to the system; for example:
1. 2300: HVAC system as a whole.
 2. 2320: HVAC Piping and Pumps.
 3. 2330: HVAC Air Distribution.
- D. Component Number: Assign numbers sequentially, using 1, 2, or 3 digits as required to accommodate the number of units in the system.
- E. Test, Revision, or Submittal Number: Number each successive iteration sequentially, starting with 1.
- F. Example: PC-2320-001.2 would be the Prefunctional Checklist for equipment item 1 in the HVAC piping system, probably a pump; this is the second, revised submittal of this checklist.

3.3 STARTUP PLANS AND REPORTS

- A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.

- B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.
- C. Submit directly to the Commissioning Authority.

3.4 PREFUNCTIONAL CHECKLISTS

- A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
 - 1. No sampling of identical or near-identical items is allowed.
 - 2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
 - 3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
 - a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
 - b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
 - c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
 - d. Serial number of installed unit.
 - e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer's start-up checklist items and minor testing.
 - f. Sensor and actuator calibration information.
- B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Authority is not required unless otherwise specified.
 - 1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
 - 2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
 - 3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
 - 4. If any Checklist line item is not relevant, record reasons on the form.
 - 5. Contractor may independently perform startup inspections and/or tests, at Contractor's option.

6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
 7. Submit completed Checklists to Commissioning Authority within two days of completion.
- C. Commissioning Authority is responsible for furnishing the Prefunctional Checklists to Contractor.
1. Initial Drafts: Contractor is responsible for initial draft of Prefunctional Checklist where so indicated in the Contract Documents.
 2. Provide all additional information requested by Commissioning Authority to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
 3. Commissioning Authority may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in the Contract Documents or not.
 4. When asked to review the proposed Checklists, do so in a timely manner.
- D. Commissioning Authority Witnessing: Required for:
1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
 2. A sampling of non-primary equipment, as allowed by the commissioning plan.
- E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Engineer.
1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

3.5 FUNCTIONAL TESTS

- A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.
- B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.
- C. Commissioning Authority is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.
- D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Engineer; if a deficiency is not corrected and re-tested immediately, the Commissioning Authority will document the deficiency and the Contractor's stated intentions regarding correction.
 1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents or does not perform properly.

2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to the Commissioning Authority; the Commissioning Authority will reschedule the test and the Contractor shall re-test.
3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
4. Contractor shall bear the cost of Engineer and Commissioning Authority personnel time witnessing re-testing.
5. Contractor shall bear the cost of Engineer and Commissioning Authority personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.

E. Functional Test Procedures:

1. Some test procedures are included in the Contract Documents; where Functional Test procedures are not included in the Contract Documents, test procedures will be determined by the Commissioning Authority with input by and coordination with Contractor.
2. Examples of Functional Testing:
 - a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
 - b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
 - c. Systems are run through all the HVAC control system's sequences of operation and components are verified to be responding as the sequence's state.
 - d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Authority is Functional Testing.

- F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

3.6 SENSOR AND ACTUATOR CALIBRATION

- A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.

- B. Calibrate using the methods described below; alternate methods may be used, if approved by Commissioning Authority and Engineer beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.
- C. All Sensors:
1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
 2. Verify that sensors with shielded cable are grounded only at one end.
 3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
 4. Tolerances for critical applications may be tighter.
- D. Sensors Without Transmitters - Standard Application:
1. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
 2. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
 3. If not, install offset, calibrate or replace sensor.
- E. Sensors With Transmitters - Standard Application.
1. Disconnect sensor.
 2. Connect a signal generator in place of sensor.
 3. Connect ammeter in series between transmitter and building automation system control panel.
 4. Using manufacturer's resistance-temperature data, simulate minimum desired temperature.
 5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
 6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
 7. Record all values and recalibrate controller as necessary to comply with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
 8. Reconnect sensor.
 9. Make a reading with a calibrated test instrument within 6 inches of the site sensor.

10. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
 11. If not, replace sensor and repeat.
 12. For pressure sensors, perform a similar process with a suitable signal generator.
- F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:
1. Watthour, Voltage, Amperage: 1 percent of design.
 2. Pressure, Air, Water, Gas: 3 percent of design.
 3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F.
 4. Relative Humidity: 4 percent of design.
 5. Barometric Pressure: 0.1 inch of Hg.
 6. Flow Rate, Air: 10 percent of design.
 7. Flow Rate, Water: 4 percent of design.
 8. AHU Wet Bulb and Dew Point: 2.0 degrees F.
- G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.
- H. Valve/Damper Stroke Setup and Check:
1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
 2. Set pump/fan to normal operating mode.
 3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
 4. Command valve/damper to open; verify position is full open and adjust output signal as required.
 5. Command valve/damper to a few intermediate positions.
 6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
- I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.
1. With full pressure in the system, command valve closed.
 2. Use an ultra-sonic flow meter to detect flow or leakage.

3.7 TEST PROCEDURES - GENERAL

- A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
- B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.
- C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
 - 1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
 - 2. Sampling is not allowed for:
 - a. Major equipment.
 - b. Life-safety-critical equipment.
 - c. Prefunctional Checklist execution.
 - 3. XX = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.
 - 4. YY = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
 - 5. Randomly test at least XX percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
 - 6. If YY percent of the units in the first sample fail, test another XX percent of the remaining identical units.
 - 7. If YY percent of the units in the second sample fail, test all remaining identical units.
 - 8. If frequent failures occur, resulting in more troubleshooting than testing, the Commissioning Authority may stop the testing and require Contractor to perform and document a checkout of the remaining units prior to continuing testing.
- D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").
- E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.
- F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.

- G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.
- H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.
- I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
 - 1. All points that are monitored by the relevant control system shall be trended by Contractor; at the Commissioning Authority's request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
 - 2. Other points will be monitored by the Commissioning Authority using dataloggers.
 - 3. At the option of the Commissioning Authority, some control system monitoring may be replaced with datalogger monitoring.
 - 4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
 - 5. Graphical output is desirable and is required for all output if the system can produce it.
 - 6. Monitoring may be used to augment manual testing.

3.8 BUILDING ENVELOPE COMMISSIONING

- A. General: Comply with the following procedural requirements:
 - 1. IgCC 2018 Building Envelope System Commissioning.
- B. Verify that the building envelope has been sufficiently completed for testing to commence.
- C. Submit a detailed narrative of proposed pressure test procedures prior to the test. Include a plan view showing proposed installation locations (personnel doors or other similar openings) for blower doors (or flexible ducts for trailer-mounted fans, if used).
- D. Test the completed building and demonstrate that the air leakage rate of the building envelope does not exceed the specified requirements.
- E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Engineer.
 - 1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

3.9 OPERATION AND MAINTENANCE MANUALS

- A. Add design intent documentation furnished by Engineer to manuals prior to submission to Engineer.

- B. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.
- C. Commissioning Authority will add commissioning records to manuals after submission to Engineer.

END OF SECTION

SECTION 02 41 00 - SELECTIVE DEMOLITION**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Selective demolition of built site elements.
- B. Selective demolition of building elements for alteration purposes.
- C. Salvage of existing items to be reused or recycled.

1.2 DEFINITIONS

- A. Existing to Remain: Existing items that are not to be removed or dismantled, except to the degree indicated for performing required Work.
- B. Remove: To detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- C. Remove and Reinstall: To detach items from existing construction in a manner to prevent damage, to prepare for reuse, and to reinstall where indicated.
- D. Retain: To keep and protect from damage existing items that are not to be removed or dismantled.
- E. Salvage: To protect removed or dismantled items from damage and to deliver them to Owner ready for reuse.

1.3 REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.4 MATERIALS OWNERSHIP

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

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be demolished.
 - 2. Review structural load limitations of existing structures.
 - 3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review and finalize protection requirements.
 - 5. Review procedures for noise control.

6. Review procedures for protection of adjacent buildings.
7. Review items to be salvaged and returned to Owner.

1.6 SUBMITTALS

- A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for dust control and noise control, and for environmental protection. Indicate proposed locations and construction of barriers.
- B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
- C. Project Record Documents:
 1. Record Drawings: Accurately record actual locations of capped and active utilities and subsurface construction.
 2. Inventory: Submit a list of items that have been removed and salvaged.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with notification regulations of authorities having jurisdiction before beginning removal and dismantling work. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.8 FIELD CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- B. Notify Architect and Owner of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. Hazardous Materials:
 1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.
 2. Hazardous materials will be removed by Contractor .
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 PRODUCTS -- NOT USED**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.

PART 3 EXECUTION**3.1 DEMOLITION**

- A. Remove other items indicated, for salvage, relocation, and recycling.
- B. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 31 22 00.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Comply with applicable requirements of NFPA 241.
 - 3. Use of explosives is not permitted.
 - 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 5. Provide, erect, and maintain temporary barriers and security devices.
 - 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 8. Do not close or obstruct roadways or sidewalks without permit.
 - 9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
 - 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Do not begin removal until built elements to be salvaged or relocated have been removed.

- D. Protect existing structures and other elements that are not to be removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.
 - 3. Stop work immediately if adjacent structures appear to be in danger.
- E. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- F. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.
- G. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
 - 1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
- H. Perform demolition in a manner that maximizes salvage and recycling of materials.
 - 1. Comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.
 - 2. Dismantle existing construction and separate materials.
 - 3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

3.3 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.
- B. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove items indicated on drawings.
- C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
 - 1. Verify that abandoned services serve only abandoned facilities before removal.
 - 2. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.
- D. Selective Demolition Procedures: 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. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- E. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.

3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

F. Protection:

1. Temporary Shoring:
 - a. Prevent movement of structure; provide shoring and bracing if necessary.
 - b. Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
2. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - a. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - b. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - c. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - d. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - e. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 - Temporary Facilities and Controls
3. Remove temporary barricades and protections where hazards no longer exist.

G. Cutting and Patching:

1. Perform cutting to accomplish removals neatly and as specified for cutting new work.
2. Repair adjacent construction and finishes damaged during removal work.

3. Patch as specified for patching new work.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- C. Loose Plaster: Identify loose, nonhistoric plaster, and separate it from its substrate by tapping with a hammer and prying with a chisel or screwdriver. Do not use pry bars. Leave sound, firmly adhered plaster in place. Do not damage, remove, or dismantle historic plasterwork, except where indicated or where it is an immediate hazard to personnel and as approved by Architect.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

3.6 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Remove from site all materials not to be reused on site; comply with requirements of Section 01 74 19 - Waste Management.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 02 41 13 – SELECTIVE SITE DEMOLITION**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

- A. Requirements of the Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections apply to all work under this section.
- B. All materials and construction methods shall be in accordance with the City of Baltimore "Standard Specifications for Material, Highways, Bridges, Utilities, and Incidental Structures," 2006 edition, hereinafter referred to as the "Standard Specifications," City of Baltimore Standard Details dated March 2008 and as amended on the drawings.
- C. Throughout the specifications, types of materials may be specified by manufacturer's name and catalogue number in order to establish standards of quality and performance and not for the purpose of limiting competition. Alternate methods and/or materials may be submitted to the Engineer for consideration. Those judged to be equal to that specified will receive written approval.

1.2 SUMMARY

- A. Furnish all labor, materials, tools, equipment and services necessary for and reasonably incidental to complete the selective site demolition work as indicated on the drawings or specified.
- B. General intent of selective site demolition work is indicated on drawings and described herein.
- C. This Section requires removal and disposal, off site, of the following:
 - 1. Entrance drive, parking structures, utilities, and adjacent site improvements to limits indicated on drawings.
- D. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Summary of Work" for use of the building and phasing requirements.
 - 2. Division 2 Section "Selective Structure Demolition" for cutting and patching procedures for selective demolition operations.
 - 3. Division 1 Section "Construction Progress Documentation" for demolition schedule requirements.
 - 4. Division 1 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures for selective demolition operations.
 - 5. Division 1 Section "Construction Waste Management and Disposal" for LEED requirements relating to demolition.

6. Division 32 Section "Planting" for protecting trees remaining on-site.
7. Division 31 Section "Site Clearing" for site clearing and removing above, and below, grade improvements.
8. Division 31 Section "Excavation, Filling & Grading" for soil materials, excavating, backfilling, and site grading.
9. Division 23 Sections for cutting, patching, or relocating mechanical items.
10. Division 26 Sections for cutting, patching, or relocating electrical items.

1.3 REGULATORY REQUIREMENTS

- A. Conform to current Baltimore City Building Code and other applicable codes for demolition, safety of structures, dust control, service utilities, and all discovered hazards to include asbestos and lead paint.
- B. Obtain and have on file all required permits.
- C. Comply with Section 024113.14 and Section 022413.16 of the Standard Specifications.
- D. Pay all permit and associated fees
 1. City will obtain and pay for the construction permit. Contractor is responsible for disposal fees beyond what is covered in the construction permit.

1.4 OWNERSHIP OF REMOVED MATERIALS

- A. Prior to Notice of proceed, City will remove all equipment, materials and fixtures the Engineer wishes to retain. After which all equipment, material and fixtures become the property of the Contractor to be removed from the premises and disposed by the Contractor.

1.5 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Proposed schedule of operations coordination for shutoff, capping, and continuation of utility services as required.
 1. Provide a detailed sequence of demolition and removal work to ensure uninterrupted progress of Engineer's on-site operations.
- C. Digital color photographs of existing adjacent structures and site improvements shall be submitted to the Engineer. All photographs will be saved on USB flash drive and saved in JPEG file format with a file name to include calendar date, site or room taken (for example, 20190625-Bathhouse-MensLockerRm-Photo1.jpg).

1.6 JOB CONDITIONS

- A. Demolition Phasing

1. The contractor shall prepare and submit a demolition/construction staging plan to the Engineer for approval prior to beginning any construction.
- B. Condition of Structures: Engineer assumes no responsibility for actual condition of structures to be demolished.
1. The Engineer assumes no responsibility for actual condition of structures to be demolished.
 2. Conditions existing at time of inspection for bidding purpose will be maintained by Engineer insofar as practicable. However, variations within structure may occur by Engineer's removal and salvage operations prior to start of demolition work.
- C. Salvage Materials: Items of salvable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.
1. Storage or sale of removed items will not be permitted on site.
- D. Explosives: Use of explosives will not be permitted.
- E. Traffic: Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- F. Protections: Ensure safe passage of persons around area of demolition. Conduct operations to prevent damage to adjacent buildings, structures, and other facilities and injury to persons.
- G. Damages: Promptly repair damages caused to adjacent facilities by demolition operations.
- H. Utility Services: Maintain existing utilities indicated to stay in service and protect against damages during demolition operations.
1. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.
- I. Utility Services: Refer to Division 23 and 26 sections for disconnecting, removing, and capping of utility services. Do not start demolition work until utility disconnections have been completed and verified in writing.

1.7 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.
1. General selective demolition experience is insufficient experience for selective demolition work involving historic buildings, materials, and artifacts.
- B. Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of selective

demolition work, including protection of surrounding and substrate materials and Project site.

- C. Regulatory Requirements: Comply with notification regulations of authorities having jurisdiction before beginning removal and dismantling work. Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 2 PRODUCTS -- NOT APPLICABLE

PART 3 EXECUTION

3.1 PREPARATION

- A. Provide, erect and maintain temporary barricades, fences, security devices and other means of protection around work area in compliance with Federal, State, and County safety regulations.
- B. Install or attached temporary warning signage as required or as directed by the Engineer.
- C. Protect existing items and structures adjacent to area of the demolition and any existing items within limits of construction that are not indicated to be removed or demolished.
- D. Protect from damage existing surfaces or materials to remain in place during demolition. Protect follows with suitable coverings when necessary. Any surface or materials to remain that are damaged during demolition shall be repaired or replaced by Contractor at no cost to the Owner.
- E. Protect existing underground utilities during demolition operations. Call "Miss Utility" (800) 257-7777) at least 48 hours prior to starting work. Perform necessary test pits as required to complete the project. Existing utilities damaged during demolition operation shall be repaired at no cost to the Owner.
- F. Verify the utilities have been disconnected and capped.
- G. Notify adjacent owners and the Engineer related to the adjacent Park Headquarters or associated uses which may affect their property, potential noise, utility outage, or disruption. Coordinate with the Engineer.

3.2 DEMOLITION REQUIREMENTS

- A. Conduct demolition to minimize interference with existing roads and sidewalks designated to remain.
- B. Conduct operations with minimum interference to public or private accesses.
- C. Maintain protected egress and access at all times. Do not close or obstruct roadways or sidewalks without permits and/or by written approval by the Engineer. Obtain approval from the Engineer for egress and access plans prior to beginning demolition.
- D. Cease operations immediately if adjacent structures or existing structures to remain appear to be in danger. Notify the Engineer.

- E. Remove demolished materials from site at regular intervals as work progresses.
- F. Do not burn any materials or debris on the project site.
- G. Make every effort to keep to a minimum noise, dust, vibrations, and other activities which would bother the inhabitants in adjacent buildings.
- H. Demolish work in such manner as to avoid hazard to persons and property. Prevent the spread of dust and flying particles by keeping work thoroughly wetted down; provide water and necessary connections therefore. Provide adequate protection of persons and property at all times. Provide for all temporary dust proof partitions where called for or as required to stop the flow of dust and debris from the area of construction into the inhabited areas.
- I. Upon completion, leave the premises (and project site area) in a clean condition, free from hazards or unsightly appearances.
- J. Contractor shall contact the Department of Recreation and Parks a minimum of two weeks prior to the delivery of salvage items for instructions as to where to deposit the site elements. Removed salvaged materials as per contract plans to be delivered by Contractor to a City Yard as directed by the Engineer
- K. Pollution Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air. Comply with governing regulations pertaining to environmental protection.
 - 1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
- L. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.
- M. Existing underground utility demolition:
 - 1. Excavate and expose existing underground utilities and related structures designated for, or as required to implement, removals. For excavation operations, refer to Section 312000 - Earth Moving. Remove existing utility structure castings. Backfill excavations upon completion of utility demolition operations. For backfill operations, refer to Section 312000 - Earth Moving.
- N. Existing site improvements demolition:
 - 1. Existing subsurface conditions: Verify existing conditions of each respective site during pre-bid inspection. Obtain written authorization from the Engineer before conducting test hole explorations of existing pavement surfaces or structures with the project site. Conditions existing during pre-bid inspections will not be altered or modified.

3.3 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Remove daily from site accumulated debris, rubbish, and other materials resulting from demolition operations.
- B. Burning of combustible materials from demolished structures will not be permitted on site.

- C. Removal: Transport materials removed from demolished structures and legally dispose of offsite.
- D. The contractor shall provide "dumpsters" for his own trash removal use. Dumpsters, when full, shall be promptly emptied, and refuse removed from the premises all at the contractor's cost.

3.4 EXCAVATION

- A. Excavation and backfill required for demolition of piping and other utility structures shall conform to applicable specifications regarding utility construction.

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Concrete formwork.
- B. Floors and slabs on grade.
- C. Concrete reinforcement.

1.2 REFERENCE STANDARDS

- A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.
- B. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- C. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
- D. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- E. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
- F. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
- G. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing.
- H. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
- I. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- J. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- K. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- B. Mix Design: Submit proposed concrete mix design.
- C. Test Reports: Submit report for each test or series of tests specified.

1.4 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS**2.1 FORMWORK**

- A. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
 - 1. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
 - 2. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
 - 3. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.2 REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1. Type: Deformed billet-steel bars.
 - 2. Finish: Unfinished.
- B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
 - 1. WWR Style: As indicated on drawings.
- C. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.3 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.

2.4 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder:
1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
 - a. Thickness: 15 mil minimum.
 2. Products:
 - a. Henry Company; Moistop Ultra 15: www.henry.com/#sle.
 - b. Stego Industries, LLC: www.stegoindustries.com/#sle.
 - c. W. R. Meadows, Inc; PERMINATOR Class A - 15 mils (0.38 mm): www.wrmeadows.com/#sle.
- B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
1. Grout: Comply with ASTM C1107/C1107M.
 2. Height Change, Plastic State; when tested in accordance with ASTM C827/C827M:
 - a. Maximum: Plus 4 percent.
 - b. Minimum: Plus 1 percent.
 3. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch.
 4. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch.

2.5 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- D. Normal Weight Concrete:
1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.
 2. Maximum Slump: 4 inches.

3. Maximum Aggregate Size: 3/4 inch.

2.6 MIXING

- A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
- B. Transit Mixers: Comply with ASTM C94/C94M.
- C. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.2 PREPARATION

- A. Verify that forms are clean and free of rust before applying release agent.
- B. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
- C. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- D. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.3 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

3.4 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- C. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

3.5 SLAB JOINTING

- A. Locate joints as indicated on drawings.
- B. Create slab control joints as soon as concrete can be walked on and before random shrinkage cracks form.

3.6 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Maximum Variation of Surface Flatness:
 - 1. Exposed Concrete Floors: 1/4 inch in 10 feet.
- B. Correct the slab surface if tolerances are less than specified.

3.7 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:

3.8 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

3.9 FIELD QUALITY CONTROL

- A. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
- B. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.
- C. See Statement of Structural Tests and Special Inspections for additional information.

3.10 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 04 20 00 - UNIT MASONRY**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Concrete block.
- B. Mortar and grout.
- C. Reinforcement and anchorage.
- D. Flashings.
- E. Lintels.
- F. Accessories.

1.2 REFERENCE STANDARDS

- A. ACI Code-530/530.1-13: Building Code Requirements and Specification for Masonry Structures and Companion Commentaries.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.
- D. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- F. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
- G. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.
- H. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens).
- I. ASTM C1194 - Standard Test Method for Compressive Strength of Architectural Cast Stone.
- J. ASTM C1195 - Standard Test Method for Absorption of Architectural Cast Stone.
- K. ASTM C1364 - Standard Specification for Architectural Cast Stone.
- L. ASTM C1506 - Standard Test Method for Water Retention of Hydraulic Cement-Based Mortars and Plasters.
- M. ASTM C33/C33M - Standard Specification for Concrete Aggregates.

- N. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
- O. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units.
- P. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
- Q. ASTM C150/C150M - Standard Specification for Portland Cement.
- R. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
- S. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
- T. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
- U. ASTM C476 - Standard Specification for Grout for Masonry.
- V. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- W. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.
- X. ASTM C1072 - Standard Test Method for Measurement of Masonry Flexural Bond Strength.
- Y. ASTM D1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber.
- Z. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications.
- AA. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- BB. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- CC. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry.
- DD. BIA Technical Notes No. 20 - Cleaning Brickwork.
- EE. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing.
- FF. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls.
- GG. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls.
- HH. BIA Technical Notes No. 46 - Maintenance of Brick Masonry.
- II. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.

JJ. NCMA TEK 8-2A - Removal of Stains from Concrete Masonry.

1.3 SUBMITTALS

- A. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- B. Samples: Submit two samples of decorative block and facing brick units to illustrate color, texture, and extremes of color range. Submit two samples of colored mortar per selection.
- C. Sample Panels for Initial Selection: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects.
 - 1. Build sample panels for each type of exposed unit masonry construction (including Brick Masonry, Concrete Masonry Units, Acoustic Concrete Masonry Units, and Decorative/Ground Face Concrete Masonry Units) in sizes approximately 60 inches (1500 mm) long by 48 inches (1200 mm) high by full thickness.
 - a. Build sample panels for each pairing of Brick Masonry described below, as well as for each type of Concrete Masonry Unit (including acoustic masonry and all products listed in ground face/decorative "Available Products"). Architect and Owner shall select brick masonry and ground face/decorative concrete unit masonry material after sample panels are constructed. Coordinate timing of construction of sample panels with Construction Manager to ensure timely delivery of material for all masonry construction.
 - b. Build sample panels in a location that can remain undisturbed until Mockup panels are fully constructed. Build sample panels in a location facing east in which all panels receive identical sunlight conditions at the same time between 9 AM and 11 AM (without shadowing on some panels) so that materials can be evaluated in identical lighting conditions.
 - 2. Clean exposed faces of panels with masonry cleaner indicated.
 - 3. Protect approved sample panels from the elements with weather-resistant membrane.
 - 4. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

- D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- E. Manufacturer's Certificate: Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.
- F. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 - 2. Include test reports, according to ASTM C1019, for grout mixes required to comply with compressive strength requirement.
- G. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.4 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
 - 1. Maintain one copy of each document on project site.
- B. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
1. Provide special shapes for corners, jambs, sashes, movement joints, headers, bonding, and other locations as indicated on drawings.
 2. For sills, caps, and similar applications that would otherwise expose unfinished surfaces, provide units without cores or frogs and with exposed surfaces finished.
 3. Provide bullnose units for outside corners of interior CMUs unless otherwise indicated.
- B. Concrete Block: Comply with referenced standards and as follows:
1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
 2. Load-Bearing Units: ASTM C90, normal weight.
 - a. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
- C. Decorative CMUs: ASTM C90
1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
 2. Load-Bearing Units:
 - a. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
 - b. Density: 130 pcf min.
 3. Non-Loadbearing Units: ASTM C129:
 - a. Lightweight
 4. Decorative CMU Schedule:
 - a. Basis of design manufacturer: Westbrook Concrete Block Co, Inc.
 - b. Acceptable alternative manufacturers:
 - 1) York Building Products
 - c. 042000-C: Provide manufacturer's ground face finished block. Provide manufacturer's full range of colors for Architect's selection.

- D. Units with Integral Water Repellent: Concrete block units as specified in this section with polymeric liquid admixture added to concrete masonry units at the time of manufacture.
1. Performance of Units with Integral Water Repellent:
 - a. Water Permeance: When tested per ASTM E514/E514M and for a minimum of 72 hours.
 - 1) No water visible on back of wall above flashing at the end of 24 hours.
 - 2) No flow of water from flashing equal to or greater than 0.032 gallons per hour at the end of 24 hours.
 - 3) No more than 25 percent of wall area above flashing visibly damp at end of test.
 - b. Flexural Bond Strength: ASTM C1072; minimum 10 percent increase.
 - c. Compressive Strength: ASTM C1314; maximum 5 percent decrease.
 2. Use only in combination with mortar that also has integral water repellent admixture.
 3. Use water repellent admixtures for masonry units and mortar by a single manufacturer.
 4. Locations: Exposed exterior units and as indicated.

2.3 CAST STONE TRIM UNITS

- A. Acceptable Manufacturers:
1. Sun Precast Co., Inc.
 2. Northern Virginia Cast Stone
 3. Stafford Stone Works
- B. Architectural concrete product manufactured to simulate appearance of natural granite, complying with ASTM C1364.
1. Compressive Strength: ASTM C1194, 6500 psi min at 28 days.
 2. Absorption: per ASTM C1195: 6% maximum at 28 days.
 3. Portland Cement: Type I or III, white, ASTM C150/C150M
 4. Coarse Aggregates: Granite, quartz or limestone, ASTM C33/C33M, except for gradation.
 5. Fine aggregates: Natural sands, except for gradation.

- 6. Colors: Inorganic iron oxide pigments, ASTM C494/C494M
- 7. Admixtures: ASTM C494/C494M
- C. Color and Finish
 - 1. Fine grain texture, free of voids and bugholes.
 - 2. Color: As selected by Architect from Manufacturer's custom colors.
- D. Shapes: Provide shapes indicated on drawings.
 - 1. Variation from Any Dimension, Including Bow, Camber, and Twist:
Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
 - 2. Unless otherwise indicated on drawings, provide:
 - a. Wash or slope of 1:12 on exterior horizontal surfaces.
 - b. Drips on projecting components, wherever possible.
 - c. Raised fillets at back of sills and at ends to be built in.
- E. Materials
 - 1. Portland Cement: ASTM C150/C150M.
 - a. For Mortar: Type I or II, except Type III may be used in cold weather.
 - 2. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.
 - 3. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.
- F. Reinforcing: per ASTM A615/A615M, epoxy coated when within 1 1/2 inch of the surface.
- G. Anchors: Type 304 stainless steel.

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredient
- D. Mortar Aggregate: ASTM C144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
- E. Grout Aggregate: ASTM C404.
- F. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
- G. Water: Clean and potable.
- H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- I. Integral Water Repellent Admixture for Mortar: Polymeric liquid admixture added to mortar at the time of manufacture.
1. Use only in combination with masonry units manufactured with integral water repellent admixture.
 2. Use only water repellent admixture for mortar from the same manufacturer as water repellent admixture in masonry units.
 3. Meet or exceed performance specified for water repellent admixture used in masonry units.

2.5 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; galvanized.
- B. Masonry Joint Reinforcement, General: ASTM A951/A951M.
- C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.
- D. Single Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Truss or ladder.
 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
 3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
- E. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Truss, with adjustable ties or tabs spaced at 16 in on center.

2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
3. Size: 0.1875 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inch wire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.
4. Vertical adjustment: Not more than 1 1/4 inches.

2.6 FLASHINGS

- A. Metal Flashing Materials:
 1. Stainless Steel Flashing: ASTM A666, Type 304, soft temper; 26 gauge, 0.0187 inch thick; finish 2B to 2D. Stainless Steel shall be DFARS (Defense Federal Acquisition Regulation Supplement).
- B. Factory-Fabricated Flashing Corners and End Dams: Stainless steel. Stainless Steel shall be DFARS (Defense Federal Acquisition Regulation Supplement).
- C. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.
- D. Termination Bars: manufacturer's standard continuous length 1" Stainless steel bar with sealant lip complete with stainless steel fasteners; compatible with membrane and adhesives.
- E. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.
- F. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.
- G. Locations:
 1. Exterior door heads.
 2. Window heads and sills.
 3. Storefront and curtain wall heads.
 4. Horizontal control joints.
 5. Changes in veneer materials, vertically.
 6. Other wall openings.
 7. Other locations indicated.

2.7 ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
- D. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D226/D226M, Type I ("No.15" asphalt felt).
- E. Weeps:
 - 1. Type: Polyester mesh.
 - 2. Color(s): As selected by Architect from manufacturer's full range.
 - 3. Size: 3 1/2" x 3 1/2" (sized for larger brick).
 - 4. Color: As selected by Architect from manufacturer's full range.
- F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in place. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- G. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials. Use manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.8 LINTELS

- A. Precast Concrete Lintels: 6 by 8 inch size, 3000 psi strength at 28 days.

2.9 MORTAR AND GROUT MIXES

- A. Mortar for Unit Masonry: ASTM C270, using the Property Specification.
 - 1. Exterior and interior masonry: Type S.
- B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.

1. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Decorative CMUs.
- C. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2. for specified 28-day compressive strength indicated, but no less than 3000 psi.
 3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C143/C143M.
- D. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.
- E. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.
- D. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.4 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running, unless otherwise indicated.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave.

3.5 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.
- F. Interlock intersections and external corners, except for units laid in stack bond.
- G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- I. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.
- J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.6 WEEPS/CAVITY VENTS

- A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels, at bottom of walls, and near top of walls.

3.7 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.
- C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.8 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement not more than 8 inches on center in foundation walls and parapet walls.
- C. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- D. Place continuous joint reinforcement in first and second joint below top of walls.
- E. Lap joint reinforcement ends minimum 6 inches.

3.9 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 - 1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at non-masonry construction.
 - 2. Remove or cover protrusions or sharp edges that could puncture flashings.
 - 3. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Extend metal flashings to within 1/2 inch of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.
- C. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.10 LINTELS

- A. Install precast concrete lintels over openings, unless steel lintels are indicated.

3.11 GROUTED COMPONENTS

- A. Lap splices minimum 24 bar diameters.
- B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- C. Place and consolidate grout fill without displacing reinforcing.

3.12 CAST STONE INSTALLATION

- A. Mechanically anchor each cast stone unit.
- B. Setting:
 - 1. Drench cast stone components with clear, running water immediately before installation.
 - 2. Set units in a full bed of mortar unless otherwise indicated.
 - 3. Fill vertical joints with mortar.
 - 4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
- C. Joints: Make all joints 3/8 inch, except as otherwise detailed.
 - 1. Rake mortar joints 3/4 inch for pointing.
 - 2. Remove excess mortar from face of stone before pointing joints.
 - 3. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.
 - 4. Leave the following joints open for sealant:
 - a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
 - b. Joints in projecting units.
 - c. Joints between rigidly anchored units, including soffits, panels, and column covers.
 - d. Joints below lugged sills and stair treads.
 - e. Joints below ledge and relieving angles.
 - f. Joints labeled "expansion joint".
- D. Sealant Joints: Install sealants as specified in Section 07 9005.
- E. Installation Tolerances:

1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.
 2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
 3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.
 4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.
- F. Repairs: Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet.
1. Repair with matching touchup material provided by the manufacturer and in accordance with manufacturer's instructions.
 2. Repair methods and results subject to Architect 's approval.

3.13 CONTROL JOINTS IN CONCRETE MASONRY

- A. Install control joints at locations indicated on the drawings in all concrete masonry walls.
- B. Nonstructural reinforcement, such as horizontal joint reinforcement, shall not be continuous through control joints.
- C. Structural reinforcement, such as bond beam reinforcement, shall be continuous through control joints.
- D. Install preformed control joint gaskets in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.14 TOLERANCES

- A. Maximum Variation from Alignment of Columns: 1/4 inch.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
- G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.15 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, conduit, and sleeves. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.16 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage and pay for special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to the International Building Code and the Statement of Structural Tests and Special Inspections.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, laps, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
 - 4. Inspect all masonry vertical reinforcement.
- C. Testing Frequency: One set of tests for each 1500 sq. ft. of wall area or portion thereof.
- D. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C67 for compressive strength.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140/C140M for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for mortar air content and compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

3.17 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

- B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 4. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes No. 20.
 - 5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 - 6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
 - 7. Clean stone trim to comply with stone supplier's written instructions.

3.18 PROTECTION

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.
 - 2. Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.
 - 3. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

- 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Shop fabricated steel and aluminum items.
- B. Steel framing and supports for applications where framing and supports are not specified in other Sections.

1.2 REFERENCE STANDARDS

- A. SSPC-SP6 - Commercial Blast Cleaning.
- B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
- C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- G. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- H. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
- I. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- J. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- K. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- L. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
- M. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.

- N. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- O. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- P. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric].
- Q. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- R. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].
- S. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
- T. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- U. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- V. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.
- W. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc..
- X. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
- Y. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").
- Z. SSPC-SP 2 - Hand Tool Cleaning.

1.3 SUBMITTALS

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Slotted Channel Framing: ASTM A653/A653M, Grade 33.

- F. Slotted Channel Fittings: ASTM A1011/A1011M.
- G. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.
- H. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, galvanized to ASTM A153/A153M where connecting galvanized components.
- I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- J. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- K. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.2 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.
- C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210/B210M, 6063 alloy, T6 temper.
- D. Aluminum-Alloy Bars: ASTM B211/B211M, 6061 alloy, T6 temper.
- E. Bolts, Nuts, and Washers: Stainless steel.
- F. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.3 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.4 FABRICATED ITEMS

- A. Ledge Angles, Shelf Angles, Channels, and Plates not attached to Structural Framing including, but not limited to:

1. Loose bearing and leveling plates.
 2. Curtainwall and storefront head, sill, and jamb locations as shown on drawings and required by design loads.
 3. Masonry sill and coping support.
- B. Lintels: As detailed.
1. Exterior: Galvanized finish, unpainted.
 2. Interior: Prime paint finish.
- C. Door Frames for Overhead Door Openings and Wall Openings: Channel and Angle sections; prime paint finish.
- D. Slotted Channel Framing: Fabricate channels and fittings from structural steel complying with the referenced standards; factory-applied, rust-inhibiting thermoset acrylic enamel finish.

2.5 FINISHES - STEEL

- A. Prime paint steel items.
1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.
 2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
- B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- C. Prime Painting: One coat.
- D. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements.
- E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.6 FINISHES - ALUMINUM

- A. Exterior Aluminum Surfaces: superior performance organic coating.
- B. Interior Aluminum Surfaces: high performance organic coating.
- C. High Performance Organic Coating System: AAMA 2604 multiple coat, thermally cured fluoropolymer system; color as selected from manufacturer's standard colors.
- D. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system; color as selected from manufacturer's standard colors.

2.7 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION**3.1 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal and aluminum where site welding is required.
- B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.3 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Obtain approval prior to site cutting or making adjustments not scheduled.
- D. After erection, prime welds, abrasions and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.4 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 06 10 00 - ROUGH CARPENTRY**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Structural dimension lumber framing.
- B. Fire retardant treated wood materials.
- C. Communications and electrical room mounting boards.
- D. Concealed wood blocking, nailers, and supports.

1.2 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings.
- C. AWPA U1 - Use Category System: User Specification for Treated Wood.
- D. NELMA (SGR) - Standard Grading Rules for Northeastern Lumber.
- E. PS 1 - Structural Plywood.
- F. PS 20 - American Softwood Lumber Standard.
- G. SPIB (GR) - Grading Rules.
- H. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17.
- I. WWPA G-5 - Western Lumber Grading Rules.

1.3 SUBMITTALS

- A. Product Data: Provide technical data on wood preservative materials and wood lumber and panel materials.
- B. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS**2.1 GENERAL REQUIREMENTS**

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. MR Credit 3: BPDO - Sourcing of Raw Materials: Provide regionally sourced recycled material. Documentation indicating locations of recovery, manufacture, purchase of recycled raw materials.

2.2 DIMENSION LUMBER

- A. Grading Agency: Northeastern Lumber Manufacturers Association; NELMA (SGR).
- B. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- C. Grading Agency: West Coast Lumber Inspection Bureau; WCLIB (GR).
- D. Grading Agency: Western Wood Products Association; WWPA G-5.
- E. Sizes: Nominal sizes as indicated on drawings, S4S.
- F. Moisture Content: S-dry or MC19.
- G. Joist and Rafter Framing (2 by 6 through 4 by 16):
 - 1. Machine stress-rated (MSR) as follows:
 - a. Fb-single; minimum extreme fiber stress in bending: 1350 psi.
 - b. E; minimum modulus of elasticity: 1,300,000 psi.
 - 2. Species: Allowed under grading rules.
 - 3. Grade: No. 1 and Better.
- H. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2.

2.3 CONSTRUCTION PANELS

- A. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- B. Other Applications:
 - 1. Plywood Concealed From View But Located Within Exterior Enclosure: APA Rated Plywood, PS 1, C-C Plugged or better, Exposure 1.
 - 2. Plywood Exposed to View But Not Exposed to Weather: APA Rated Plywood, PS 1, A-D, or better.
 - 3. Other Locations: APA Rated Plywood, PS 1, C-D Plugged or better.

2.4 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish:
 - a. Electroplated complying with ASTM F1941, unless noted otherwise.
 - b. Hot-dipped galvanized steel complying with ASTM B695, Class 55 for fire retardant-treated wood locations.
 - c. Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations.
- B. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.

2.5 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
 - 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.2 FRAMING INSTALLATION

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices unless otherwise specifically detailed.
- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.

3.3 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.
- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- F. Provide the following specific nonstructural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.

7. Tack boards and marker boards.
8. Wall paneling and trim.
9. Joints of rigid wall coverings that occur between studs.
10. Other locations as indicated on drawings..

3.4 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.5 INSTALLATION OF CONSTRUCTION PANELS

- A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 3. Install adjacent boards without gaps.

3.6 CLEANING

- A. Waste Disposal: See Section 01 74 19 - Construction Waste Management and Disposal.
 1. Comply with applicable regulations.
 2. Do not burn scrap on project site.
 3. Do not burn scraps that have been pressure treated.
 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 41 00 - ARCHITECTURAL WOOD CASEWORK**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Specially fabricated cabinet units.
- B. Hardware.

1.2 REFERENCE STANDARDS

- A. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0.
- D. BHMA A156.9 - American National Standard for Cabinet Hardware.
- E. NEMA LD 3 - High-Pressure Decorative Laminates.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
- B. Product Data: Provide data for hardware accessories.
- C. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

1.6 FIELD CONDITIONS

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS**2.1 CABINETS**

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2.2 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.
- B. Provide sustainably harvested wood, certified or labeled; see Section 01 60 00.
- C. Provide wood harvested within a 500 mile radius of the project site.

2.3 PANEL CORE MATERIALS

- A. Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system; cured under heat and pressure; comply with ANSI A208.2.

2.4 LAMINATE MATERIALS

- A. Manufacturers:
 - 1. Formica Corporation: www.formica.com/#sle.
 - 2. Wilsonart LLC: www.wilsonart.com/#sle.
- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

2.5 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
 - 1. Color: As selected by Architect from manufacturer's standard range.
 - 2. Use at all exposed edges.
- C. Fasteners: Size and type to suit application.
- D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- E. Adjustable Drawer Organization Systems: Drawer trays, dividers, and connectors.
- F. Grommets: Standard plastic grommets for cut-outs, in color to match adjacent surface.

2.6 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

- B. Metal Z-Shaped Wall Cabinet Support Clips: Paired, cleated, structural anchorage components applied to back of cabinets and walls for wall cabinet mounting.
 - 1. Stand-Off: 0.240 inch.
- C. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch spacing adjustments.
- D. Countertop Support Brackets: Fixed, L-shaped, face-of-stud mounting.
 - 1. Materials: Steel; T-shape cross-section.
 - a. Finish: Manufacturer's standard, factory-applied, powder coat.
- E. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers.
- F. Drawer Slides:
 - 1. Type: Standard extension.
 - 2. Static Load Capacity: Commercial grade.
 - 3. Mounting: Side mounted.
 - 4. Stops: Integral type.
- G. Soft-Close, Door and Drawer Adjustable Dampers:
- H. Hinges: European style concealed self-closing type, steel with nickel-plated finish.

2.7 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- C. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
- D. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.8 SHOP FINISHING

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:

1. Transparent:
 - a. Sheen: Flat.
2. Opaque:
 - a. Color: As selected by Architect.
 - b. Sheen: Flat.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

3.2 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 07 26 00 - VAPOR RETARDERS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Vapor retarders.

1.2 REFERENCE STANDARDS

- A. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
- B. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; ICC Evaluation Service, Inc..

1.3 SUBMITTALS

- A. Product Data: Provide data on material characteristics, performance criteria, and limitations.
- B. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.5 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS**2.1 VAPOR RETARDERS**

- A. Underslab Vapor Retarders: See Section 03 30 00.
- B. Vapor Retarder Sheet: Butyl, black color.
 - 1. Thickness: 45 mil, 0.045 inch.
 - 2. Water Vapor Permeance: 0.1 perm, maximum, when tested in accordance with ASTM E96/E96M.
 - 3. Seam Lap and Perimeter Adhesive: Elastomeric, same composition as sheet or other compatible material.

2.2 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Vapor Retarder and Adjacent Substrates: As indicated, complying with vapor retarder manufacturer's installation instructions.

- B. Sealant for Cracks and Joints in Substrates: Resilient elastomeric joint sealant compatible with substrates and vapor retarder materials.
 - 1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch, nominal thickness.
- C. Flexible Flashing: Self-adhering or mechanically-attached flashing used for wall penetrations in accordance with ICC-ES AC148 requirements.
- D. Vapor Retarder Tape: Coated polyester film with acrylic adhesive backing; pressure sensitive.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install materials in accordance with manufacturer's installation instructions.
- B. Vapor Retarders: Install continuous airtight barrier over surfaces indicated, with sealed seams and sealed joints to adjacent surfaces.
- C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

3.2 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 31 13 - ASPHALT SHINGLES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Asphalt shingle roofing.
- B. Flexible sheet membranes for eave protection and underlayment.

1.2 REFERENCE STANDARDS

- A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- B. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules.
- C. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings.
- D. ASTM F1667/F1667M - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- E. NRCA (RM) - The NRCA Roofing Manual.

1.3 SUBMITTALS

- A. Product Data: Provide data indicating material characteristics, performance criteria, and limitations.
- B. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern ; for color selection.
- C. Manufacturer's Installation Instructions: Indicate installation criteria and procedures.
- D. Installer's qualification statement.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacture of roofing systems similar to those required for this project, with not less than 5 years of documented experience.
- B. Installer Qualifications: Company specializing in installing asphalt shingles, with at least 3 years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store materials with labels intact in manufacturer's unopened packaging until ready for installation.

- B. When storing roofing materials on roofing system ensure that no damage occurs to supporting members and other materials.

1.6 FIELD CONDITIONS

- A. Do not install shingles, eave protection membrane, underlayment, or _____ when surface, ambient air, or wind chill temperatures are below 45 degrees F.

1.7 WARRANTY

- A. Provide lifetime manufacturer's warranty for coverage against black streaks caused by algae.
- B. Provide 5-year manufacturer's warranty for wind damage.
- C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Asphalt Shingles:
 1. Certainteed Roofing; Landmark Premium Shingles: www.certainteed.com/#sle.
 2. GAF; Timberline HDZ RS Shingles: www.gaf.com/#sle.
 3. Owens Corning Corp: www.owenscorning.com/#sle.

2.2 ASPHALT SHINGLES

- A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462/D3462M.
 1. Fire Resistance: Class A, complying with ASTM E108.
 2. Wind Resistance: 80-mph minimum.
 3. Algae resistant.
 4. Weight: 250 lb/100 sq ft.
 5. Self-sealing type.
 6. Style: Match existing..
 7. Color: Match existing.

2.3 SHEET MATERIALS

- A. Eave Protection Membrane: Self-adhering polymer-modified asphalt sheet complying with ASTM D1970/D1970M; 40 mil total thickness; with strippable treated release paper and polyethylene sheet top surface.

- B. Products:
 - 1. Procure eave protection product from same manufacturer as shingle manufacturer..
- C. Underlayment: Synthetic non-asphaltic sheet, intended by manufacturer for mechanically fastened roofing underlayment without sealed seams.
 - 1. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
 - 2. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
 - 3. Fasteners: As recommended by manufacturer or building code qualification report or approval.
 - 4. Products:
 - a. Certaineed Roofing; WinterGuard: www.certainteed.com/#sle.

2.4 ACCESSORIES

- A. Roofing Nails: Standard round wire shingle type, galvanized steel, stainless steel, aluminum roofing nails, or copper roofing nails, minimum 3/8-inch head diameter, 12-gauge, 0.109-inch nail shank diameter, 1-1/2 inches long and complying with ASTM F1667/F1667M.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions prior to starting this work.
- B. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.2 PREPARATION

- A. Seal roof deck joints wider than 1/16 inch as recommended by shingle manufacturer.
- B. At areas where eave protection membrane is to be adhered to substrate, fill knot holes and surface cracks with latex filler.
- C. Broom clean deck surfaces before installing underlayment or eave protection.

3.3 INSTALLATION

- A. Eave Protection Membrane:
 - 1. Install eave protection membrane from eave edge to minimum 48 inches up-slope beyond interior face of exterior wall.
- B. Underlayment:

1. Roof Slopes Up to 4:12: Install two layers of underlayment over area not protected by eave protection, with ends and edges weather lapped minimum 4 inches; stagger end laps of each consecutive layer and nail in place.
 2. Weather lap and seal watertight with plastic cement any items projecting through or mounted on roof.
- C. Shingles:
1. Install shingles in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
 - a. Fasten individual shingles using two nails per shingle, or as required by manufacturer and local building code, whichever is greater.
 - b. Fasten strip shingles using four nails per strip, or as required by manufacturer and local building code, whichever is greater.
 2. Place shingles in straight coursing pattern with 5-inch weather exposure to produce double thickness over full roof area, and provide double course of shingles at eaves.
 3. Project first course of shingles 3/4 inch beyond fascia boards.
 4. Extend shingles 1/2 inch beyond face of gable edge fascia boards.
 5. Complete installation to provide weathertight service.

END OF SECTION

SECTION 07 46 33 - PLASTIC SIDING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Plastic siding and trim.
- B. Plastic soffit and trim.
- C. Plastic column cover and trim.
- D. Soffit vents

1.2 REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].

1.3 SUBMITTALS

- A. 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.
- B. Color Samples: Where colors are not specified, provide samples of manufacturer's entire color line for selection.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Not less than three years of experience with products specified.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Plastic Siding:
- B. Plastic Soffit Panels:
 - 1. AZEK Exteriors.
- C. Plastic Column Covers:
 - 1. AZEK Exteriors.

2.2 MATERIALS

- A. Plastic Siding:
1. Thickness: 7/16 inch, minimum.
 2. Length: 12 feet, minimum.
 3. Finish: Smooth.
 4. Color: As selected by Architect from manufacturers full range of available colors.
 5. Basis of Design: AZEK Bevel Siding or approved equal.
- B. Plastic Soffit Panels:
1. Thickness:
 - a. Soffit: 1/2"
 - b. Panel: 1/2"
 - c. Fascia: 4/4"
 - d. Frieze: 5/4"
 2. Size (Boards): 12 feet long, minimum. 12" wide, minimum.
 3. Size (Panels): 4 feet x 8 feet, minimum.
 4. Finish: Smooth.
 5. Color: As selected by Architect from manufacturer's full range of available colors.
 6. Basis of Design: Soffit, Vented Soffit, Notched Fascia, and Frieze Board by AZEK or approved equal.
- C. Plastic Column Covers:
1. Basis of Design: AZEK 3-Plus-1 Column Wrap or approved equal.

2.3 ACCESSORIES

- A. Accessories: Provide coordinating accessories made of same material as required for complete and proper installation even when not specifically indicated on drawings.
1. Color: Match adjacent siding or soffit panels.
- B. Column Accessories: Provide crown and base trim kits by same manufacturer as column wraps.

- C. Exterior Soffit Vents: Continuous, perforated, ASTM B221 ASTM B221M 6063 alloy, T5 temper, aluminum, with J-flange and manufactured especially for soffit application, and provide continuous vent.
 - 1. Basis of Design: Soffit Vent with J-Flange by ClarkDietrich
 - 2. Provide widest vent possible based on existing conditions.
 - 3. Install blocking as required to install vents.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrate conditions before beginning installation; verify dimensions and acceptability of substrate.
- B. Do not proceed with installation until unacceptable conditions have been corrected.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

- A. Install siding, soffit, and trim in accordance with manufacturer's printed installation instructions.
- B. Attach securely to framing, not sheathing, with horizontal components true to level and vertical components true to plumb, providing a weather resistant installation.
- C. Exterior Soffit Vents: Install according to manufacturer's written instructions and in locations indicated on drawings, and provide vent area _____.
- D. Clean dirt from surface of installed products, using mild soap and water.

END OF SECTION

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Fabricated sheet metal items, including brake metal, copings, flashings, counterflashings, gutters, downspouts, metal trim, and _____ .
- B. Flashing for roof drains and roof penetrations.
- C. Downspout boots.

1.2 REFERENCE STANDARDS

- A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- E. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.4 SUBMITTALS

- A. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- B. Samples for Initial Selection: Submit two samples _____ inch x _____ inch minimum in size illustrating metal color for each material and color.
- C. Samples for Verification: Submit two samples 3 by 3 inch minimum in size illustrating metal finish color for each material and color.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

- A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc, shop pre-coated with PVDF coating.
 - 1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
- B. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); shop pre-coated with modified silicone coating.
 - 1. Silicone Modified Polyester Coating: Pigmented organic powder coating, AAMA 2603; baked enamel finish system.

2.2 METAL FLASHING APPLICATIONS

- A. Brake Metal (076200-A)
 - 1. Material: Pre-Finished Aluminum
 - 2. Color: As selected by Architect
- B. Gutter (076200- K)
 - 1. Material: Pre-Finished Aluminum
 - 2. Color: As selected by Architect
 - 3. Fabrication: SMACNA (ASMM) Rectangular profile
 - 4. Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with SMACNA (ASMM).
 - 5. Anchorage Devices: Profiled to suit gutters and downspouts in accordance with SMACNA or as recommended by manufacturer.
 - 6. Supports: Brackets.
- C. Downspouts (076200-J)
 - 1. Material: Pre-Finished Aluminum
 - 2. Color: As selected by Architect
 - 3. Fabrication: Rectangular profile
 - 4. Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with SMACNA (ASMM).

5. Anchorage Devices: Profiled to suit gutters and downspouts in accordance with SMACNA or as recommended by manufacturer.
 6. Supports: Brackets.
 7. Downspout Extenders: Same material and finish as downspouts.
- D. Drip Edge (076200-M)
1. Material: Pre-Finished Aluminum
 2. Color: As selected by Architect

2.3 FABRICATION - GENERAL

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Tin edges of copper sheet to be soldered; solder shop formed metal joints, and after soldering, remove flux, wipe and wash solder joints clean; provide weathertight joints.
- F. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- G. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.4 ACCESSORIES

- A. Fasteners: Same material and finish as flashing metal, with soft neoprene washers.
- B. Primer: Zinc chromate type.
- C. Concealed Sealants: Non-curing butyl sealant.
- D. Plastic Cement: ASTM D4586/D4586M, Type I.
- E. Downspout Boots: Cast iron with integral cleanout. Coordinate size and transition shapes with specified downspout and Civil drawings. Provide all required fasteners.

PART 3 EXECUTION**3.1 EXAMINATION**

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.3 INSTALLATION

- A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Seal or solder metal joints watertight for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with clean water.
- E. Secure gutters and downspouts in place with concealed fasteners.
- F. Slope gutters 1/4 inch per 10 feet, minimum.
- G. Connect downspouts to downspout boots, and grout connection watertight.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

1.02 REFERENCE STANDARDS

- A. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants.
- B. ASTM C834 - Standard Specification for Latex Sealants.
- C. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- E. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
- F. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.
- H. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
- I. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168.

1.03 SUBMITTALS

- A. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 4. Substrates the product should not be used on.

5. Substrates for which use of primer is required.
 6. Substrates for which laboratory adhesion and/or compatibility testing is required.
- B. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, VOC content, and recommended tools.
- C. Color Cards for Preliminary Selection: Where sealant color is not specified, submit manufacturer's color cards showing full range of colors available for selection. Architect may select up to three colors for final selection at each condition.
- D. Field Samples for Verification: Provide a maximum of three color samples for each condition requiring color selection (up to 6 locations selected by Architect), including custom colors, installed in-situ, 12 inches in length, to be reviewed by Architect for final color selection.
- E. Preconstruction Laboratory Test Reports: Submit with Product Data.
- F. Joint Sealant Schedule: Include the following information:
1. Joint sealant substrate application, joint location, and designation.
 2. Joint sealant manufacturer and product name.
 3. Joint sealant primer and backer.
 4. Joint sealant color.
 5. Any special conditions.
- G. Field Quality Control Plan: Submit at least two weeks prior to start of installation.
- H. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience and approved by manufacturer.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.
- D. Preconstruction Laboratory Testing:

1. Adhesion Testing: In accordance with ASTM C794.
 2. Compatibility Testing: In accordance with ASTM C1087.
 3. Stain Testing: In accordance with ASTM C1248; required only for porous substrates.
 4. Provide data showing previous testing on each combination of sealant, substrate, backing and accessories used on this Project, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.
 - a. If a substrate used on the Project has not been tested within the last 24 months, arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories. Allow sufficient time for testing to avoid delaying the work, and deliver sufficient samples to manufacturer for testing. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
- E. Field Quality Control Plan:
1. Visual inspection of entire length of sealant joints.
 2. Destructive field adhesion testing of sealant joints, except interior sealant joints.
 - a. For each different sealant and substrate combination, allow for one test every 1000 linear feet (305 meters).
 - b. If any failures occur in the first 1000 linear feet, continue testing at frequency of one test per 500 linear feet at no extra cost to Owner.
 3. Field testing agency's qualifications.
 4. Field Quality Control Log Form: Show same data fields as on Joint Sealant Schedule, adding date of installation of field sample to be tested and date of test, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.
- F. Field Adhesion Test Procedures:
1. Allow sealants to fully cure as recommended by manufacturer before testing.
 2. Have a copy of the test method document available during tests.
 3. Take photographs or make video records of each test, with joint identification provided in the photos/videos; for example, provide small erasable whiteboard positioned next to joint.

4. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
 5. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
 6. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
 7. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.
- G. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
1. Sample: At least 18 inches long.
 2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the "1 inch mark" is that distance from the substrate, the test has failed.
 3. If either adhesive or cohesive failure occurs prior to minimum elongation, take necessary measures to correct conditions and re-test; record each modification to products or installation procedures.
 4. Record results on Field Quality Control Log.
 5. Repair failed portions of joints.

1.05 WARRANTY

- A. Correct defective work within a five year period after Date of Substantial Completion.
- B. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.
 1. Provide 20-year warranty for silicones; minimum 10-year warranty for urethanes.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.

1. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
 2. Pecora Corporation: www.pecora.com.
 3. Sherwin-Williams Company: www.sherwin-williams.com.
 4. Sika Corporation: www.usa-sika.com.
 5. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
- B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
1. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
 2. Pecora Corporation: www.pecora.com.
 3. Sika Corporation: www.usa-sika.com.
 4. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
 5. W.R. Meadows, Inc: www.wrmeadows.com/sle.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:

1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
 - a. Wall expansion and control joints.
 - b. Joints between door, window, and other frames and adjacent construction.
 - c. Joints between different exposed materials.
 - d. Openings below ledge angles in masonry.
 - e. Other joints indicated below.
2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
 - a. Joints between door, window, and other frames and adjacent construction.
 - b. Other joints indicated below.
3. Do not seal the following types of joints.

- a. Intentional weepholes in masonry.
 - b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
 - c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
 - d. Joints where installation of sealant is specified in another section.
 - e. Joints between suspended panel ceilings/grid and walls.
- B. Exterior Joints: Use nonsag non-staining silicone sealant, unless otherwise indicated.
- 1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
 - 2. Control and Expansion Joints in Concrete Paving: Self-leveling or Nonsag polyurethane "traffic-grade" sealant.
 - 3. Concealed, non-dynamic "bedding" joints, such as door thresholds: Butyl rubber, non-curing
- C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
- 1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
 - 2. Floor Joints in Wet Areas: Nonsag or Self-leveling polyurethane "traffic-grade" sealant suitable for continuous liquid immersion.
 - 3. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; \diamond .
 - 4. Narrow Control Joints in Interior Exposed Concrete Slabs: Self-leveling epoxy sealant.
 - 5. Tile control and expansion joints in Wet Areas: Mildew-resistant silicone sealant
- D. Interior Wet Areas include: Bathrooms, restrooms, and kitchens; fixtures in wet areas include plumbing fixtures, countertops, cabinets, and other similar items.

2.03 NONSAG JOINT SEALANTS

- A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
- 1. Movement Capability: Plus and minus 50 percent, minimum.
 - 2. Non-Staining To Porous Materials: Non-staining to porous materials when tested in accordance with ASTM C1248.

3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 4. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
 5. Custom Color: To be selected by Architect from manufacturer's full full range.
 6. Cure Type: Single-component, neutral moisture curing.
 7. Custom Color: To be selected by Architect.
- B. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multicomponent; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
 2. Hardness Range: 25 to 35, Shore A, when tested in accordance with ASTM C661.
 3. Custom Color: To be selected by Architect from manufacturer's full full range.
- C. Nonsag "Traffic-Grade" Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multicomponent; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
1. Movement Capability: Plus and minus 25 percent, minimum.
 2. Hardness Range: 25 to 35, Shore A, when tested in accordance with ASTM C661.
 3. Color: To be selected by Architect from manufacturer's full range.
- D. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
1. Color: To be selected by Architect from manufacturer's full range.
- E. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion.
1. Movement Capability: Plus and minus 25 percent, minimum.
 2. Hardness Range: 25 to 35, Shore A, when tested in accordance with ASTM C661.
 3. Color: To be selected by Architect from manufacturer's full range.
- F. Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; ASTM C920, Grade P, Uses M and A; single or multicomponent; explicitly approved by manufacturer for traffic exposure and continuous water immersion.
1. Movement Capability: Plus and minus 25 percent, minimum.

2. Hardness Range: 25 to 35, Shore A, when tested in accordance with ASTM C661.
 3. Color: To be selected by Architect from manufacturer's full range.
- G. Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
1. Composition: Single or multicomponent, 100 percent solids by weight.
 2. Durometer Hardness: Minimum of 85 for Type A or 35 for Type D, after seven days when tested in accordance with ASTM D2240.
 3. Custom Color: To be selected by Architect standard.
 4. Joint Width, Minimum: 1/8 inch.

2.04 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type C - Closed Cell Polyethylene.
 2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
 3. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.

- C. Verify that backer rods are of the correct size.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
- E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Perform acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- E. Install bond breaker backing tape where backer rod cannot be used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL

- A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

- B. Destructive Adhesion Testing: If there are any failures in first 1000 linear feet, notify Architect immediately.
- C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.
- D. Repair destructive test location damage immediately after evaluation and recording of results.

END OF SECTION 07 92 00

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Non-fire-rated hollow metal doors and frames.
- B. Thermally insulated hollow metal doors with frames.
- C. Hollow metal borrowed lites glazing frames.
- D. Accessories, including glazing, louvers, and matching panels.

1.2 ABBREVIATIONS AND ACRONYMS

- A. ANSI: American National Standards Institute.
- B. HMMA: Hollow Metal Manufacturers Association.
- C. NAAMM: National Association of Architectural Metal Manufacturers.
- D. NFPA: National Fire Protection Association.
- E. SDI: Steel Door Institute.
- F. UL: Underwriters Laboratories.

1.3 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames.
- C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors.
- D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).
- E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
- H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

- I. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
- J. ASTM C476 - Standard Specification for Grout for Masonry.
- K. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- L. ASTM E413 - Classification for Rating Sound Insulation.
- M. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames.
- N. ICC A117.1 - Accessible and Usable Buildings and Facilities.
- O. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames.
- P. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames.
- Q. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames.
- R. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames.
- S. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.
- T. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives.
- U. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
- V. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames.
- W. UL (DIR) - Online Certifications Directory.
- X. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.
- Y. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.4 SUBMITTALS

- A. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, fire-resistance ratings, and finishes.
- B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- C. Schedule: Provide a schedule of hollow metal work, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.
- D. Samples: Submit two samples of metal, 2 by 2 inches in size, showing factory finishes, colors, and surface texture.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Maintain at project site copies of reference standards relating to installation of products specified.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Hollow Metal Doors and Frames:
 1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
 2. Curries, an Assa Abloy Group company: www.assaabloydss.com.
 3. Steelcraft, an Allegion brand: www.allegion.com/#sle.

2.2 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
 1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
 3. Door Top Closures: Flush end closure channel, with top and door faces aligned.
 4. Door Edge Profile: Manufacturers standard for application indicated.
 5. Typical Door Face Sheets: Flush, smooth faces. Refer to Door Schedule for additional information.
 6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
 7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.3 HOLLOW METAL DOORS

- A. Door Finish: Factory finished.
- B. Exterior Doors: Thermally insulated.
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A 1 000 000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 - e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
 2. Core Material: Vertical steel stiffeners with fiberglass batts.
 3. Door Thickness: 1-3/4 inches, nominal.
 4. Top Closures: Flush with top of faces and edges.
 5. Weatherstripping: Refer to Section 08 71 00.
- C. Interior Doors, Non-Fire Rated:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.

- e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
- 2. Door Core Material: Manufacturer's standard core material/construction and in compliance with requirements.
- 3. Door Thickness: 1-3/4 inches, nominal.
- 4. Door Face Sheets: Flush, smooth faces.

2.4 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Frame Finish: Same as hollow metal door.
- C. Exterior Door Frames: Full profile/continuously welded type.
 - 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvanized) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
 - 2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 - 3. Weatherstripping: Separate, see Section 08 71 00.
- D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 - 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvanized) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
 - 2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
- E. Mullions for Pairs of Doors: Fixed, except where removable is indicated, with profile similar to jambs.
- F. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.
- G. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- H. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.
- I. Frames Installed Back-to-Back: Reinforce with steel channels anchored to floor and overhead structure.

2.5 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

- B. Factory Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.
 - 1. Color: As selected by Architect from manufacturer's full range.
- C. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.6 ACCESSORIES

- A. Glazing: As specified in Section 08 80 00.
- B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
- C. Astragals for Double Doors: _____
 - 1. Exterior and Non-Rated Doors: Steel, Z-shaped. Flat or T-Shaped.
 - 2. Fire-Rated Doors: Steel, shape as required for fire rating.
- D. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.
- E. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- F. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.2 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.3 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install prefinished frames after painting and wall finishes are complete.

- C. Install fire rated units in accordance with NFPA 80.
- D. Coordinate frame anchor placement with wall construction.
- E. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- F. Install door hardware as specified in Section 08 71 00.
- G. Comply with glazing installation requirements of Section 08 80 00.
- H. Coordinate installation of electrical connections to electrical hardware items.
- I. Touch up damaged factory finishes.

3.4 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.5 ADJUSTING

- A. Adjust for smooth and balanced door movement.
- B. Adjust sound control doors so that seals are fully engaged when door is closed.
- C. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

3.6 SCHEDULE - SEE DRAWINGS

END OF SECTION

SECTION 08 31 00 - ACCESS DOORS AND PANELS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Wall-mounted access units.
- B. Ceiling-mounted access units.

1.2 REFERENCE STANDARDS**1.3 SUBMITTALS**

- A. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- B. Shop Drawings: Indicate exact position of each access door and/or panel unit. Coordinate with MEP contractors.

PART 2 PRODUCTS**2.1 ACCESS DOORS AND PANELS ASSEMBLIES**

- A. Wall-Mounted Units:
 - 1. Location: Where required for access to mechanical, electrical, or plumbing components..
 - 2. Panel Material: Stainless steel, Type 304.
 - 3. Size: As required to access mechanical, electrical, or plumbing components. Minimum 12 by 12 inches.
 - 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 - 5. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.
- B. Wall-Mounted Units in Wet Areas:
 - 1. Location: Where required for access to mechanical, electrical, or plumbing components..
 - 2. Panel Material: Stainless steel, Type 304.
 - 3. Size: As required to access mechanical, electrical, or plumbing components. Minimum 12 by 12 inches.
 - 4. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.
- C. Ceiling-Mounted Units:

1. Location: Where required for access to mechanical, electrical, or plumbing components.
2. Panel Material: Stainless steel, Type 304.
3. Size - Lay-In Grid Ceilings: 24 by 24 inches.
4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that rough openings are correctly sized and located.

3.2 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 33 23 - OVERHEAD COILING DOORS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Exterior coiling doors.

1.2 REFERENCE STANDARDS**1.3 SUBMITTALS**

- A. Product Data: Provide general construction, electrical equipment, component connections and details, and _____.
- B. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
- C. Samples: Submit two slats, 2 by 2 inches in size illustrating shape, color and finish texture.
- D. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.
- E. Installer's qualification statement.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience.

1.5 WARRANTY

- A. Manufacturer Warranty: Provide three year manufacturer warranty for three-ply multifilament polyester fabric curtain. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Overhead Coiling Doors:
 - 1. Overhead Door Corporation.

2.2 COILING DOORS

- A. Heavy Duty Industrial Doors: Model 620 Stormtite Rolling Service Door by Overhead Door Corporation or approved equal.

1. Curtain: Interlocking roll-formed slats. Endlocks shall be attached to each end of alternate slats to prevent movement.
 - a. Flat profile type F-265 fabricated of 22 Ga. galvanized steel.
2. Slats and Hood Finish:
 - a. Galvanized Steel: Slats and hood galvanized in accordance with ASTM A653 and receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester top coat.
3. Powder Coat:
 - a. PowderGuard Premium powder coat color as selected by Architect.
4. Non-galvanized exposed ferrous surfaces shall receive one coat of rust-inhibitive primer.
5. Aluminum: Slats and hood shall be aluminum finished as follows:
 - a. PowderGuard Premium powder coat color as selected by Architect.
6. Weatherseals: Vinyl bottom seal, exterior guide and internal hood seals.
7. Bottom Bar: Extruded Aluminum.
8. Guides: Three structural steel angles
9. Finish: Bottom Bar, Guides, Headplate and Brackets:
 - a. PowderGuard Premium powder coat color as selected by Architect.
10. Counterbalance: Helical torsion spring type housed in steel tube or pipe barrel, supporting curtain with deflection limited to 0.03 inch per foot of span. Counterbalance is adjustable by means of an adjusting tension wheel.
11. Hood: Provide with internal hood baffle weatherseal. 24 Ga. galvanized steel with intermediate supports as required.
12. Manual Operation: Manual push.
13. Wind Load Design: 20 PSF.
14. Operation: Design door assembly, including operator, to operate for not less than 20,000 cycles.
15. Locking: Two interior bottom bar slide bolts for manually operated doors.
16. Wall Mounting Condition: Between jambs mounting.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that opening sizes, tolerances and conditions are acceptable.

3.2 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

3.3 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.

3.4 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.

3.5 CLEANING

- A. Clean installed components.

END OF SECTION

SECTION 08 43 13 - ALUMINUM-FRAMED STOREFRONTS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.

1.2 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.
- B. AAMA 501.2 - Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage.
- C. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
- D. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].
- G. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- H. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- I. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- J. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
- K. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.4 SUBMITTALS

- A. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.
- B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
 - 1. Include design engineer's stamp or seal on shop drawings for attachments and anchors.
- C. Samples: Submit two samples two by six inches in size illustrating finished aluminum surface, glass, infill panels, glazing materials.
- D. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- E. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
- F. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.7 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.8 WARRANTY

- A. Correct defective Work within a five year period after Date of Substantial Completion.
- B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- C. Provide twenty year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Aluminum-Framed Storefronts:
 - 1. Kawneer North America: www.kawneer.com/#sle.
 - 2. Oldcastle BuildingEnvelope: www.oldcastlebe.com/#sle.
 - 3. YKK AP America, Inc: www.ykkap.com/commercial/#sle.

2.2 ALUMINUM-FRAMED STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Glazing Position: Centered (front to back).
 - 2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
 - 3. Finish: Class I natural anodized.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
 - 4. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 - 5. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.

6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
7. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
8. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
9. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Performance Requirements

1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
 - a. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf.
3. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.

2.3 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
 1. Glazing Stops: Flush.
- B. Swing Doors: Glazed aluminum.
 1. Thickness: 1-3/4 inches.
 2. Top Rail: 6 inches wide.
 3. Vertical Stiles: 6 inches wide.
 4. Bottom Rail: 10 inches wide.
 5. Glazing Stops: Square.
 6. Finish: Same as storefront.

2.4 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Fasteners: Stainless steel.
- C. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.5 FINISHES

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.6 HARDWARE

- A. Other Door Hardware: See Section 08 71 00.
 - 1. Hardware by storefront manufacturer is not acceptable.

PART 3 EXECUTION**3.1 EXAMINATION**

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.2 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

- I. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 FIELD QUALITY CONTROL

- A. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
 1. Perform a minimum of two tests in each designated area as directed by Architect.
 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
- B. Provide field testing of installed storefront system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
 1. Perform a minimum of two tests in each designated area as directed by Architect.
 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
 3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
 - a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.
 4. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf.
- C. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.5 ADJUSTING

- A. Adjust operating hardware and sash for smooth operation.

3.6 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.

3.7 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 71 00 - DOOR HARDWARE**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Hardware for aluminum and hollow metal doors.
- B. Electrically operated and controlled hardware.
- C. Thresholds.
- D. Weatherstripping, seals and door gaskets.

1.2 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. BHMA A156.1 - American National Standard for Butts and Hinges.
- C. BHMA A156.3 - American National Standard for Exit Devices.
- D. BHMA A156.4 - American National Standard for Door Controls - Closers.
- E. BHMA A156.6 - American National Standard for Architectural Door Trim.
- F. BHMA A156.7 - American National Standard for Template Hinge Dimensions.
- G. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders.
- H. BHMA A156.16 - American National Standard for Auxiliary Hardware.
- I. BHMA A156.18 - American National Standard for Materials and Finishes.
- J. BHMA A156.21 - American National Standard for Thresholds.
- K. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association.
- L. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames.
- M. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.
- N. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware will be installed upon.

- B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- C. Convey Owner's keying requirements to manufacturers.

1.4 SUBMITTALS

- A. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.
- B. Hardware Schedule: Detailed listing of each item of hardware to be installed on each door. Use door numbering scheme as included in the Contract Documents. Identify electrically operated items and include power requirements.
- C. Keying Schedule: Submit for approval of Owner.
- D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- F. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.
- G. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Hardware Supplier Qualifications: Company specializing in supplying the type of products specified in this section with at least three years documented experience and approved by manufacturer.
- C. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.

1.6 WARRANTY

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Allegion Brands, lves; _____: www.allegion.com/us.
- B. Assa Abloy Brands, Corbin Russwin; _____: www.assaabloydss.com.
- C. Best Access Systems, division of Stanley Security Solutions; _____: www.bestaccess.com.

D. DORMA USA, Inc; _____: www.dorma.com.

2.2 DOOR HARDWARE - GENERAL

- A. Provide hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.
- B. Provide items of a single type of the same model by the same manufacturer.
- C. Provide products that comply with the following:
1. Applicable provisions of federal, state, and local codes.
 2. Accessibility: ADA Standards and ICC A117.1.
 3. Auxiliary Hardware: BHMA A156.16.
 4. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
 5. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.
- D. Function: Lock and latch function numbers and descriptions of manufactures series as listed in hardware schedule.
- E. Electrically Operated and/or Controlled Hardware: Provide all power supplies, power transfer hinges, relays, and interfaces required for proper operation; provide wiring between hardware and control components and to building power connection.
- F. Finishes: Provide door hardware of the same finish unless otherwise indicated.
1. Finish: Satin chrome plated over nickel on brass or bronze, 626 (approx US26D).
 2. Finish Definitions: BHMA A156.18.
 3. Exceptions:
 - a. Where base metal is specified to be different, provide finish that is an appearance equivalent according to BHMA A156.18.
 - b. Hardware for Aluminum Storefront Doors: Finished to match door, except hand contact surfaces to be satin stainless steel.

2.3 LOCKS AND LATCHES

- A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
1. Hardware Sets indicate locking functions required for each door.
 2. If no hardware set is indicated for a swinging door provide an office lockset.

3. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
 4. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.
- B. Lock Cylinders: Manufacturer's standard tumbler type, six-pin standard core.
1. Provide cams and/or tailpieces as required for locking devices required.
 2. Collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 3. Keyway: Match facility standard.
 4. Manufacturers:
 - a. Dormakaba Best (BE)
 5. Removable Cores: Provide removable cores as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- C. Keying: Each type of lock and cylinders to be factory keyed.
1. Include construction keying.
 2. Supply keys in the following quantities:
 - a. Five (5) master keys.
 - b. Ten (10) construction keys.
 - c. Two (2) change keys for each lock.
 3. When providing keying information, comply with DHI Handbook "Keying systems and nomenclature".
 4. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 5. Furnish factory cut, nickle-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 6. New System: Key locks to a new key system as directed by Owner.
 7. Key Registration List (Bitting List):
 - a. Provide keying transcript to Owner in the proper format for importing into key control software.
 - b. Provide transcript list in writing or electronic file as directed by the Owner.

- D. Latches: Provide a latch for every door, unless specifically indicated "push/pull" or "not required to latch".
- E. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set. For aluminum doors, provide manufacturer's special strike box fabricated for aluminum framing.
 - 1. Standards
 - a. Strikes for Mortise Locks and Latches: BHMA A156.13

2.4 HINGES

- A. Hinges: Provide hinges on every swinging door.
 - 1. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
 - 2. Provide ball-bearing hinges at all doors having closers.
 - 3. Provide hinges in the quantities indicated.
 - 4. Provide non-removable pins on exterior outswinging doors.
- B. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7; standard weight, unless otherwise indicated.
 - 1. Provide hinge width required to clear surrounding trim.
- C. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversable and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
- D. Quantity of Hinges Per Door:
 - 1. Doors up to 60 inches High: Two hinges.
 - 2. Doors From 60 inches High up to 90 inches High: Three hinges.
 - 3. Exterior Doors: Provide continuous geared hinges.
- E. Manufacturers - Hinges:
 - 1. Assa Abloy Brands; McKinney: www.assaabloydss.com.
 - 2. Bommer Industries, Inc; _____: www.bommer.com.
 - 3. Hager Companies; _____: www.hagerco.com.
 - 4. Pemko.

2.5 PUSH/PULLS

- A. Push/Pulls: Comply with BHMA A156.6.
1. Provide push and pull on doors not specified to have lockset, latchset, exit device, or auxiliary lock.
 2. On solid doors, provide matching push plate and pull plate on opposite faces.
- B. Manufacturers - Push/Pulls:
1. Assa Abloy Brands, McKinney; _____: www.assaabloydss.com.
 2. C. R. Laurence Company, Inc; _____: www.crl-arch.com/sle.
 3. Hager Companies; _____: www.hagerco.com.

2.6 MORTISE LOCKSETS

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
1. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.13 requirements to 14 million cycles or greater.
- B. Manufacturers - Mortise Locksets:
1. Corbin Russwin Hardware (RU) - ML2000 Series
 2. Sargent Manufacturing (SA) - 8200 Series
 3. Yale Commercial (YA) - 8800FL Series

2.7 FLUSHBOLTS AND COORDINATORS

- A. Coordinators: Provide on doors having closers and self-latching or automatic flushbolts to ensure that leaves close in proper order.

2.8 EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings.
 2. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position.

3. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 4. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 5. Narrow Stile Applications: At doors constructed with narrow stiles, provide devices designed for maximum 2" wide stiles.
 6. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 7. Rail Sizing: Provide exit device rails factory sized for proper door width application.
- B. Conventional Push Rail Exit Devices (Commercial Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified. Fabricate latchbolts from cast stainless steel, Pullman type, incorporating a deadlocking feature.
- C. Locking Functions: Functions as defined in BHMA A156.3, and as follows:
1. Entry/Exit, Always-Unlocked: Outside lever unlocked, no outside key access, no latch holdback.
 2. Entry/Exit, Free Swing: Key outside retracts latch, latch holdback (dogging) for free swing during occupied hours, not fire-rated; outside trim must be specified as lever or pull.
 3. Entry/Exit, Always-Latched: Key outside locks and unlocks lever, no latch holdback (dogging).
 4. Entry/Exit, Always-Locked: Key outside retracts latchbolt but does not unlock lever, no latch holdback.
 5. Exit Only, Secure: No outside trim, no key entry, no latch holdback, deadlocking latchbolt.
- D. Manufacturers - Exit Devices:
1. Yale (YA) - 6000 Series.

2.9 CLOSERS

- A. Closers: Complying with BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustments, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
1. Provide surface-mounted, door-mounted closers unless otherwise indicated.
 2. Provide a door closer on every exterior door.
 3. On pairs of swinging doors, if an overlapping astragal is present, provide coordinator to ensure the leaves close in proper order.
 4. At corridors, locate door-mounted closer on room side of door.
 5. At outswinging exterior doors, mount closer in inside of door.
- B. Manufacturers - Surface Mounted Closers:
1. Norton Rixson (NO) - 7500 Series
 2. Sargent Manufacturer (SA) - 351 Series
 3. Yale Commercial (YA) - 4400 Series

2.10 STOPS AND HOLDERS

- A. Stops: Complying with BHMA A156.8; provide a stop for every swinging door, unless otherwise indicated.
1. Provide wall stops, unless otherwise indicated.
 2. If wall stops are not practical, due to configuration of room or furnishings, provide overhead stop.
 3. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop unless specifically so stated.

2.11 GASKETING AND THRESHOLDS

- A. Gaskets: Complying with BHMA A156.22.
1. On each door in smoke partition, provide smoke gaskets; top, sides, and meeting stile of pairs. If fire/smoke partitions are not indicated on drawings, provide smoke gaskets on each door identified as a "smoke door" and 20-minute rated fire doors.

2. On each exterior door, provide weatherstripping gaskets, unless otherwise indicated; top, sides, and meeting stiles of pairs.
 3. On each exterior door, provide door bottom sweep, unless otherwise indicated.
- B. Thresholds: Complying with BHMA A156.21.
1. At each exterior door, provide a threshold unless otherwise indicated.
 2. At each exterior door, provide a thermally-broken threshold unless otherwise indicated.
 3. Field cut threshold to frame for tight fit.
- C. Fasteners At Exterior Locations: Non-corroding.
- D. Manufacturers - Gasketing and Thresholds:
1. Assa Abloy Brands, McKinney; _____: www.assaabloydss.com.
 2. Pemko Manufacturing Co; _____: www.pemko.com.

2.12 PROTECTION PLATES AND ARCHITECTURAL TRIM

- A. Protection Plates:
1. Kickplate: Provide on push side of every door with closer, except aluminum storefront and glass entry doors.
 2. Mop Plates: Provide on pull side of every door with closer, except aluminum storefront and glass entry doors..
 3. Size: Fabricate plates not more than 2" less than door width on stop side of single doors and 1" less on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates.
 4. Material: ANSI/BHMA A156.6 certified protection plates fabricated from stainless steel, 300 grade, 050-inch thick.
 5. Provide manufacturer's designated fastener type. Provide countersunk screw holes.
- B. Drip Guard: Provide projecting drip guard over all exterior doors unless they are under a projecting roof or canopy.
- C. Manufacturers - Protection Plates and Architectural Trim:
1. Rockwood Manufacturing Company, an Assa Abloy brand: www.rockwoodmfg.com.
 2. Trimco: www.trimcohardware.com.

2.13 KEY CONTROLS

- A. Key Management System: For each keyed lock on project, provide one set of consecutively numbered duplicate key tags with hanging hole and snap catch.
- B. Facility Manager's Key Cabinet: Sheet steel construction, piano hinged door with key lock.
 - 1. Mounting: Wall-mounted.
 - 2. Capacity: Actual quantity of keys, plus 25 percent additional capacity.
 - 3. Size key hooks to hold 6 keys each.
 - 4. Finish: Baked enamel, manufacturer's standard color.
 - 5. Key cabinet lock to building keying system.
 - 6. Locate in Office.

2.14 FIRE DEPARTMENT LOCK BOX

- A. Fire Department Lock Box: Heavy-duty, surface mounted, solid stainless-steel box with hinged door and interior gasket seal; single drill resistant lock with dust covers and tamper alarm.
 - 1. Capacity: Holds 2 keys.
 - 2. Finish: Manufacturer's standard dark bronze.
 - 3. Locate adjacent to front entrance.
 - 4. Manufacturers - Fire Department Lock Box:
 - a. Knox Company; Knox-Box Rapid Entry System, _____:
www.knoxbox.com.

PART 3 EXECUTION**3.1 EXAMINATION**

- A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available to power operated devices and of the correct characteristics.

3.2 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.

- C. Mounting heights for hardware from finished floor to center line of hardware item. As indicated in the following list; unless noted otherwise on the drawings.
 - 1. For steel doors and frames: Comply with DHI (LOCS) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames".
- D. Set exterior door thresholds with full-width bead of elastomeric sealant on each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.3 ADJUSTING

- A. Adjust hardware for smooth operation.
- B. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.4 CLEANING

- A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.5 PROTECTION

- A. Do not permit adjacent work to damage hardware or finish.

HARDWARE SETS

4.1 HARDWARE SETS - GENERAL

- A. These Hardware Sets indicate requirements for single doors of that type, with conditional requirements for pairs and other situations.
- B. Pairs of Swinging Doors: Provide one of each specified item on each leaf unless specifically stated otherwise. Treat pairs as two active leaves unless otherwise indicated.
- C. Provide functions that allow free egress at all times.

4.2 SWING DOORS -- NOT REQUIRING KEY LOCKING

- A. HW-1: Push/Pull, Non-Fire-Rated:
 - 1. Closer.
 - 2. Push/Pull.

4.3 SWING DOORS -- LOCKABLE, MAY BE LEFT UNLOCKED, KEY NOT REQUIRED TO LOCK

- A. HW-10: Office, Non-Fire-Rated:

1. Lockset, Office.
- B. HW-13: Public Entrance, Exit Device, Lockable, Non-Fire-Rated:
 1. Exit Device, Rim, Entry/Exit, Free Swing, lever outside trim.
 2. Pair: Concealed vertical rod type devices.
- C. HW-14: Restroom, Indicator, Lockable:
 1. Lockset, Lockable with integral thumbturn, Thumbturn engages occupancy indicator.

4.4 SWING DOORS -- KEY REQUIRED TO LOCK, MAY BE LEFT UNLOCKED

- A. HW-20: Classroom Lock, Non-Fire-Rated:
 1. Lockset, Classroom.

4.5 SWING DOORS -- MAY NOT BE LEFT UNLOCKED

- A. HW-30: Always-Locked, Non-Fire-Rated:
 1. Lockset, Always-Locked.
 2. Exterior Outswing Doors: Lock Guard.

END OF SECTION

SECTION 08 80 00 - GLAZING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Insulating glass units.
- B. Glazing units.
- C. Glazing compounds.

1.2 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test.
- C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
- D. ASTM C1036 - Standard Specification for Flat Glass.
- E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- F. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- G. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
- H. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
- I. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
- J. GANA (GM) - GANA Glazing Manual.
- K. GANA (SM) - GANA Sealant Manual.
- L. GANA (LGRM) - Laminated Glazing Reference Manual.
- M. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use.
- N. NFRC 100 - Procedure for Determining Fenestration Product U-factors.
- O. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
- P. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.

1.3 SUBMITTALS

- A. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- C. Samples: Submit two samples 12 by 12 inch in size of glass units.
- D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.5 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.6 WARRANTY

- A. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Float Glass Manufacturers:
 - 1. Guardian Glass, LLC: www.guardianglass.com
 - 2. Pilkington North America Inc: www.pilkington.com/na/#sle.
 - 3. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com

2.2 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - 2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 - 3. Glass thicknesses listed are minimum.
- B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
 - 1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.3 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 - 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 - 2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
 - 3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
 - 4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

2.4 INSULATING GLASS UNITS

- A. Manufacturers:
 - 1. Guardian Glass, LLC: www.guardianglass.com

2. Pilkington North America Inc: www.pilkington.com/na
 3. Viracon, Apogee Enterprises, Inc: www.viracon.com
 4. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com
 5. Oldcastle Building Envelope: www.obe.com.
- B. Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
 4. Spacer Color: Black.
 5. Edge Seal:
 - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone sealant as secondary seal applied around perimeter.
 6. Color: Black.
 7. Purge interpane space with dry air, hermetically sealed.
- C. Type GL-1 - Insulating Glass Units: Vision glass, double glazed.
1. Applications: Exterior glazing unless otherwise indicated.
 2. Space between lites filled with argon.
 3. Outboard Lite: Fully tempered float glass, 1/4 inch thick.
 - a. Tint: Clear.
 - b. Coating: Low-E (passive type), on #2 surface.
 4. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 5. Total Thickness: 1 inch.
 6. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.29, maximum.
 7. Visible Light Transmittance (VLT): 64 percent, nominal.

8. Solar Heat Gain Coefficient (SHGC): 0.28, maximum.
- D. Type GL-2 - Insulating Glass Units: Spandrel glazing.
1. Applications: Exterior spandrel glazing unless otherwise indicated.
 2. Space between lites filled with argon.
 3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Same as on vision units, on #2 surface.
 4. Inboard Lite: Fully tempered float glass, 1/4 inch thick.
 - a. Tint: Clear.
 - b. Opacifier: Ceramic frit, on #3 surface.
 5. Total Thickness: 1 inch.
 6. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.29, nominal.

2.5 GLAZING UNITS

- A. Type GL-3 - Monolithic Interior Vision Glazing:
1. Applications: Interior glazing unless otherwise indicated.
 2. Glass Type: Fully tempered float glass.
 3. Tint: Clear.
 4. Thickness: 1/4 inch, nominal.

2.6 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
- D. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION**3.1 VERIFICATION OF CONDITIONS**

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that the minimum required face and edge clearances are being provided.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify that sealing between joints of glass framing members has been completed effectively.
- E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.3 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

3.4 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.5 FIELD QUALITY CONTROL

- A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- B. Monitor and report installation procedures and unacceptable conditions.

3.6 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.7 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Performance criteria for gypsum board assemblies.
- B. Gypsum wallboard.
- C. Joint treatment and accessories.

1.2 REFERENCE STANDARDS

- A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- B. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
- C. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
- D. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- E. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base.
- F. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
- G. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
- H. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels.
- I. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- K. GA-216 - Application and Finishing of Gypsum Board.
- L. GA-600 - Fire Resistance Design Manual.

1.3 SUBMITTALS

- A. Product Data: Provide data on gypsum board, glass mat faced gypsum board, accessories, and joint finishing system.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board application and finishing, with minimum 5 years of documented experience.

PART 2 PRODUCTS**2.1 GYPSUM BOARD ASSEMBLIES**

- A. Provide completed assemblies complying with ASTM C840 and GA-216.

2.2 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
1. CertainTeed Corporation: www.certainteed.com/#sle.
 2. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
 3. National Gypsum Company: www.nationalgypsum.com/#sle.
 4. USG Corporation: www.usg.com/#sle.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for vertical surfaces, unless otherwise indicated.
 2. Glass mat faced gypsum panels, as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
 3. Unfaced fiber-reinforced gypsum panels as defined in ASTM C1278/C1278M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
 4. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold resistant board is required at all locations.
 5. Thickness: 5/8 inch unless otherwise indicated on Drawings.
- C. Abuse Resistant Wallboard:
1. Application: as indicated on drawings.
 2. Surface Abrasion: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
 3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
 4. Soft Body Impact: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.

5. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 6. Paper-Faced Type: Gypsum wallboard, as defined in ASTM C1396/C1396M.
 7. Type: Fire-resistance-rated Type X, UL or WH listed.
 8. Thickness: 5/8 inch.
 9. Edges: Tapered.
- D. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings, unless otherwise indicated.
 2. Type:
 - a. Mold resistant at all locations.
 3. Thickness: 1/2 inch.
 4. Edges: Tapered.

2.3 GYPSUM BOARD ACCESSORIES

- A. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
1. Corner Beads: Low profile, for 90 degree outside corners.
 2. L-Trim: Sized to fit 5/8 inch thick gypsum wallboard.
 3. Control Joints:
 - a. Type: V-shaped PVC with tear away fins.
- B. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
 2. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
 3. Ready-mixed vinyl-based joint compound.
 4. Powder-type vinyl-based compound.
 5. Chemical hardening type compound.
 6. Joint Compound: Setting type, field-mixed.

- C. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- D. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.
- E. Wire Mesh: Galvanized steel, hexagonal wire mesh.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.2 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
- C. Double-Layer Non-Rated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.
- D. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- E. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.

3.3 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 - 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
 - 2. At exterior soffits, not more than 30 feet apart in both directions.
 - 3. Install per GA-234/GA-216, or ASTM C840.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.4 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.
- C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 2. Level 3: Walls to receive textured wall finish.
 - 3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 - 4. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
 - 2. Taping, filling, and sanding are not required at base layer of double-layer applications.

3.5 TOLERANCES

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

END OF SECTION

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Metal partition and ceiling framing.
- B. Framing accessories.

1.2 REFERENCE STANDARDS

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
- D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- E. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- F. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
- G. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- H. ASTM E413 - Classification for Rating Sound Insulation.
- I. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

1.3 SUBMITTALS

- A. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.
- B. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

PART 2 PRODUCTS**2.1 DESCRIPTION**

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent MR testing agency.

2.2 FRAMING MATERIALS

- A. Fire Rated Assemblies: Comply with applicable code and as indicated on drawings.
- B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
 - 1. Studs: C shaped with knurled or embossed faces.
 - 2. Runners: U shaped, sized to match studs.
 - 3. Ceiling Channels: C shaped.
 - 4. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
- C. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws, and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
 - 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
 - 2. Material: ASTM A653/A653M steel sheet, SS Grade 50, with G60/Z180 hot-dipped galvanized coating.
 - 3. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.
- D. Tracks and Runners: Same material and thickness as studs, bent leg retainer notched to receive studs with provision for crimp locking to stud.
- E. Furring and Bracing Members: Of same material as studs; thickness to suit purpose; complying with applicable requirements of ASTM C754.
- F. Fasteners: ASTM C1002 self-piercing tapping screws.

- G. Sheet Metal Backing: 0.036 inch thick, galvanized.
- H. Anchorage Devices: Powder actuated.
- I. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

2.3 FABRICATION

- A. Fabricate assemblies of framed sections to sizes and profiles required.
- B. Fit, reinforce, and brace framing members to suit design requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that rough-in utilities are in proper location.

3.2 INSTALLATION OF STUD FRAMING

- A. Comply with requirements of ASTM C754.
- B. Extend partition framing to structure in all locations, unless shown otherwise on drawings.
- C. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- D. Align and secure top and bottom runners at 24 inches on center.
- E. At partitions indicated with an acoustic rating:
 - 1. Provide components and install as required to produce STC ratings as indicated, based on published tests by manufacturer conducted in accordance with ASTM E90 with STC rating calculated in accordance with ASTM E413.
- F. Place one bead of acoustic sealant between runners and substrate , studs and adjacent construction.
 - 1. Place one bead of acoustic sealant between studs and adjacent vertical surfaces.
- G. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

- H. Install studs vertically at 12, 16 or 24 inches on center, to meet specified performance requirements.
- I. Align stud web openings horizontally.
- J. Secure studs to tracks.
- K. Stud splicing is not permissible.
- L. Fabricate corners using a minimum of three studs.
- M. Install double studs at wall openings, door and window jambs, not more than 2 inches from each side of openings.
- N. Brace stud framing system rigid.
- O. Coordinate erection of studs with requirements of all openings; install supports and attachments.
- P. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.
- Q. Blocking: Use wood blocking secured to studs. Provide blocking where indicated, and for support of toilet partitions, wall cabinets, toilet accessories, and other wall mounted accessories.
- R. Furring: Install at spacing and locations shown on drawings. Lap splices a minimum of 6 inches.

3.3 CEILING AND SOFFIT FRAMING

- A. Comply with requirements of ASTM C754.
- B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
- C. Install furring independent of walls, columns, and above-ceiling work.
- D. Securely anchor hangers to structural members or embed them in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.
- E. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.
- F. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
- G. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.
- H. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches past each opening.

3.4 TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch in 10 feet.
- B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 24 00 - CEMENT PLASTERING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Cement plastering.

1.2 REFERENCE STANDARDS

- A. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- B. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster.
- C. ASTM C932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering.

1.3 SUBMITTALS

- A. Product Data: Provide data on plaster materials and trim accessories.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

1.5 MOCK-UPS

- A. Construct mock-up of exterior wall, 4 feet long by 1 feet wide, illustrating surface finish.
 - 1. Mock-up may remain as part of this work.

1.6 FIELD CONDITIONS

- A. Exterior Plaster Work: Do not apply plaster when substrate or ambient air temperature is 40 degrees F or lower, or when temperature is expected to drop below 40 degrees F within 48 hours of application.

PART 2 PRODUCTS**2.1 FACTORY PREPARED CEMENT PLASTER**

- A. Exterior Portland cement plaster system made of scratch and brown base coat, leveling coat with reinforcing mesh, and acrylic finish coat; install in accordance with ASTM C926.
 - 1. Provide weather resistive barrier as part of the system, by the same manufacturer.
- B. Finish Coating: Portland cement-based coating with acrylic admixture, integrally colored, and trowel applied.

2.2 ACCESSORIES

- A. Lath:
 - 1. Wire Size: 17 gauge, 0.453 inch.
 - 2. Galvanized: ASTM A641/A641M.
 - 3. Opening Size: 11/16 by 1-1/2 inches.
- B. Finishing Accessories: ASTM C1063; extruded aluminum alloy (6063 T5), galvanized steel sheet ASTM A924/A924M G90, rolled zinc, or rigid plastic, unless noted otherwise.
 - 1. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed plaster edges.
- C. Bonding Compound: Provide type recommended for bonding plaster to solid surfaces, complying with ASTM C932.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions are acceptable prior to starting this work.
- B. Verify masonry joints are flush and surfaces are ready to receive work of this section, and that there are no existing bituminous or water repellent coatings on masonry surfaces.
- C. Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are properly in place.
- D. Verify mechanical and electrical equipment and services located within areas to receive this work have been properly tested and approved.

3.2 PREPARATION

- A. Dampen masonry surfaces to reduce excessive suction.
- B. Roughen smooth concrete surfaces and apply bonding compound in accordance with manufacturer's written installation instructions.

3.3 INSTALLATION - WATER-RESISTIVE BARRIER

- A. Where cement plaster is installed as part of a barrier wall system, install two layers of water-resistive barrier in accordance with water-resistive barrier manufacturer's instructions.
- B. Integrate water-resistive barrier with flashing accessories, and adjacent doors, windows, penetrations, and cladding transitions.
- C. Apply water-resistive barrier horizontally with upper layer lapped over lower layer at least 2 inches.

3.4 MIXING

- A. Mix only as much plaster as can be used prior to initial set.
- B. Mix materials dry, to uniform color and consistency, before adding water.
- C. Protect mixtures from frost or freezing temperatures, contamination, and excessive evaporation.

3.5 APPLICATION

- A. Apply plaster in accordance with manufacturer's written instructions and comply with ASTM C926.

3.6 REPAIR

- A. Patching: Remove loose, damaged or defective plaster and replace with plaster of same composition; finish to match surrounding area.

END OF SECTION

SECTION 09 67 00 - FLUID-APPLIED FLOORING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Fluid-applied flooring and base.

1.2 REFERENCE STANDARDS

- A. ANSI/ESD STM7.1 - Standard Test Method for the Protection of Electrostatic Discharge Susceptible Items - Floor Materials - Resistive Characterization of Materials.
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

1.3 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.
- B. Samples for Verification: Submit two samples, 12 by 12 inch in size illustrating color, pattern and texture for each floor material for each color specified.
- C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and application rate for each coat.
- D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section.
 - 1. Minimum five years of documented experience.
 - 2. Approved by manufacturer.
- C. Supervisor Qualifications: Trained by product manufacturer , under direct full time supervision of manufacturer's own foreman.

1.5 MOCK-UPS

- A. Construct mock-up(s) of fluid applied flooring to serve as basis for evaluation of texture and workmanship.
 - 1. Number of Mock-Ups to be Prepared: Two.
 - 2. Use same materials and methods for use in the work.
 - 3. Use approved design samples as basis for mock-ups.
 - 4. Locate where directed.
 - 5. Minimum Size: 48 inches by 48 inches.
- B. Obtain approval of mock-up by Architect before proceeding with work.
- C. Approved mock-up may remain as part of the work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resin materials in a dry, secure area.
- B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.7 FIELD CONDITIONS

- A. Maintain minimum temperature in storage area of 55 degrees F.
- B. Store materials in area of installation for minimum period of 24 hours prior to installation.
- C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

1.8 WARRANTY

- A. Submit written warranty signed by floor coating Manufacturer and installer agreeing to repair or replace floor coatings that do not meet requirements or that deteriorate within the warranty period indicated below. Warranty is to cover both materials and labor required for replacement.
 - 1. Warranty Period: 5 years after date of Substantial Completion.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Fluid-Applied Flooring:
 - 1. Sika Corporation: www.sikafloorusa.com/#sle.

2.2 FLUID-APPLIED FLOORING SYSTEMS

- A. Fluid-Applied Flooring: Epoxy base coat(s), with broadcast aggregate.
1. Aggregate: Quartz granules. Double Broadcast.
 2. System Thickness: 1/8 inch, nominal, dry film thickness (DFT).
 3. Texture: Slip resistant.
 4. Cove Base Texture: Smooth.
 5. Sheen: Gloss.
 6. Color: Match Architect's Design Sample.
 7. System Components: Manufacturer's standard components that are compatible with each other and as follows:
 - a. Primer.
 - b. 1st Receiver Coat & Broadcast Aggregate Media.
 - c. 2nd Receiver Coat & Broadcast Aggregate Media.
 - d. Topcoat or Sealer.
 8. Products:
 - a. Crossfield Products Corp.; Dex-O-Tex Decor-Flor system with Quik-Glaze Topcoat.
 - b. BASF Corp.; MasterTop 1234 with MasterTop TC 683 Series Clear Topcoat.
 - c. Sika Corporation; Sikafloor Quartzite Broadcast System with Sikafloor 217 Receiver and Topcoat.
 - d. Stonhard, Inc.; Stonshield SLT System with Stonkote CE4 Sealer.

2.3 ACCESSORIES

- A. Waterproofing Membrane: Type recommended or produced by manufacturer of Fluid-Applied Flooring system for type of service and floor condition indicated.
- B. Anti-Microbial Additive: Incorporate anti-microbial chemical additive to control growth of most bacteria, fungi, algae and actinomycetes.
1. Provide anti-microbial additive in all flooring.
- C. Floor Transition Strips: At locations indicated on drawings.
- D. Cant Strips: Molded of flooring resin material.

- E. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.
- F. Primer: Type recommended by fluid-applied flooring manufacturer.
- G. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.
- C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for fluid-applied flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test as Follows:
 - a. Alkalinity (pH): ASTM F710.
 - b. Internal Relative Humidity: ASTM F2170.
 - c. Moisture Vapor Emission: ASTM F1869.
 - 2. Obtain instructions if test results are not within limits recommended by fluid-applied flooring manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.
- B. Prepare concrete control joints and expansion joints according to flooring manufacturer's instructions.
- C. Mechanically prepare (shot-blast) concrete surfaces according to flooring manufacturer's instructions.
- D. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.
- E. Vacuum clean substrate.
- F. Apply primer to surfaces required by flooring manufacturer.

3.3 TERMINATIONS

- A. Chase edges to "lock" the flooring system into the concrete substrate along lines of termination.
- B. Penetration Treatment: Lap and seal flooring system onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.
- C. Trenches: Continue flooring system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.
- D. Treat floor drains by chasing the flooring system to lock in place at point of termination.

3.4 JOINTS AND CRACKS

- A. Treat control joint to bridge potential cracks and to maintain monolithic protection.
- B. Treat cold joints and construction joint cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.
- C. Treat vertical and horizontal contraction and expansion joints by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.5 INSTALLATION - ACCESSORIES

- A. Install cant strips at base of walls where flooring is to be extended up wall as base.

3.6 INSTALLATION - FLOORING

- A. Apply in accordance with manufacturer's instructions.
- B. Apply each coat to minimum thickness required by manufacturer.
- C. Hand trowel cove base mix to wall surfaces at locations shown on Finish Schedule to form cove base height of 4 inches unless otherwise indicated. Follow manufacturer's printed instructions and details including taping, mixing, priming, troweling, sanding, and top-coating of cove base.

3.7 FIELD QUALITY CONTROL

- A. Test installed floor surface in accordance with ANSI/ESD STM7.1 .

3.8 PROTECTION

- A. Prohibit traffic on floor finish for 48 hours after installation.
- B. Barricade area to protect flooring until fully cured.

- C. Cleaning: Remove temporary covering and clean flooring just prior to final inspection. Use cleaning materials and procedures recommended by flooring manufacturer.

END OF SECTION

SECTION 09 91 13 - EXTERIOR PAINTING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - 1. Exposed surfaces include those whether or not scheduled colors are designated.
 - 2. Exposed surfaces of steel lintels and ledge angles.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Marble, granite, slate, and other natural stones.
 - 6. Floors, unless specifically indicated.
 - 7. Ceramic and other types of tiles.
 - 8. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
 - 9. Exterior insulation and finish system (EIFS).
 - 10. Glass.
 - 11. Concealed pipes, ducts, and conduits.

1.2 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.
- B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.
- C. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.

- D. COMAR 26.11.39 - Architectural and Industrial Maintenance (AIM) Coatings.
- E. SCAQMD 1113 - South Coast Air Quality Management District Rule No.1113.
- F. SSPC-SP 1 - Solvent Cleaning.
- G. SSPC-SP 2 - Hand Tool Cleaning.
- H. SSPC-SP 6 - Commercial Blast Cleaning.

1.3 SUBMITTALS

- A. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- B. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
- C. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, care and cleaning instructions, touch-up procedures, and repair of painted and finished surfaces.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
 - 2. Label each container with color in addition to the manufacturer's label.
- E. VOC Submittals:
 - 1. Product Data for field-applied primers, paints and coatings, including printed statement of Product Type and VOC content, and current limit as published by Maryland Department of the Environment, COMAR 26.11.39.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience and approved by manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.6 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints: Provide products by one of the following manufacturers:
 - 1. Base Manufacturer: Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - 2. PPG Paints: www.ppgpaints.com/#sle.
 - 3. Benjamin Moore & Company: www.benjaminmoore.com.
- C. Primer Sealers: Same manufacturer as top coats.

2.2 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
4. Supply each paint material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:

1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. SCAQMD 1113 Rule.
 - c. CARB (SCM).
 - d. Maryland Department of the Environment, COMAR 26.11.39.
 - e. Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings; www.otcair.org.
 - f. Architectural coatings VOC limits of the State in which the Project is located.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: To be selected from manufacturer's full range of available colors.

1. Selection to be made by Architect after award of contract.
2. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.3 PAINT SYSTEMS - EXTERIOR

A. Paint E-OP - 1: Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including wood and primed wood.

1. Two top coats and one coat primer.

2. Top Coat(s): Exterior Acrylic Latex.
 - a. Products: .
 - 1) Sherwin-Williams, Emerald Exterior Acrylic Latex.
 3. Top Coat Sheen:
 - a. Satin: MPI gloss level 4; use this sheen at all locations.
 4. Primer: As recommended by top coat manufacturer for specific substrate.
 5. Top Coat Minimum Volume Solids: 38%.
- B. Paint E-OP - 2: Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete and stucco.
1. Two top coats and one coat primer.
 2. Top Coat(s): Exterior Acrylic Latex.
 - a. Products:
 - 1) Sherwin-Williams, Loxon Self-Cleaning Acrylic Coating.
 3. Top Coat Sheen:
 - a. Flat: MPI gloss level 1; use this sheen at all locations.
 4. Primer: As recommended by top coat manufacturer for specific substrate.
 5. Primer for concrete: Alkali Resistant Primer Sealer.
 6. Primer for concrete masonry units: Exterior Latex Block Filler.
 7. Top Coat Minimum Volume Solids: 40%.
- C. Paint E-OP-MExterior Metal Surfaces to be Painted, not included in High Performance Coatings: Including HM doors and frames (all surfaces), miscellaneous exposed steel.
1. Two top coats and one coat primer.
 2. Top Coat(s): Exterior Light Industrial Water Based Acrylic Alkyd.
 - a. Products:
 - 1) Sherwin-Williams, Pro Industrial WB Alkyd Urethane.
 3. Top Coat Sheen:
 - a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.

4. Primer: As recommended by top coat manufacturer for specific substrate.
5. Top Coat Minimum Volume Solids: 32%.

2.4 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 1. Exterior Plaster and Stucco: 12 percent.
 2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 3. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.

- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Concrete:
 - 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 - 2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi at 6 to 12 inches. Allow to dry.
 - 3. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.
- G. Exterior Gypsum Board: Fill minor defects with exterior filler compound. Spot prime defects after repair.
- H. Exterior Plaster: Fill hairline cracks, small holes, and imperfections with exterior patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- I. Galvanized Surfaces:
 - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 - 2. Prepare surface according to SSPC-SP 2.
- J. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
 - 3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
- K. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.
- L. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

- B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.
- C. Apply products in accordance with manufacturer's written instructions.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.
- G. Sand wood and metal surfaces lightly between coats to achieve required finish.
- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 91 23 - INTERIOR PAINTING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - 1. Exposed surfaces include those whether or not scheduled colors are designated.
 - 2. Where suspended ceiling systems such as 'clouds' are held away from or do not touch wall surfaces, all surfaces above 'clouds' shall be painted.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Any items not permitted to be painted by the AHJ.
 - 6. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
 - 7. Marble, granite, slate, and other natural stones.
 - 8. Floors, unless specifically indicated.
 - 9. Ceramic and other tiles.
 - 10. Brick, architectural concrete, cast stone, integrally colored plaster, and stucco.
 - 11. Glass.
 - 12. Acoustical materials, unless specifically indicated.
 - 13. Concealed pipes, ducts, and conduits.

1.2 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.

- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
- C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating.
- D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board.
- E. COMAR 26.11.39 - Architectural and Industrial Maintenance (AIM) Coatings.
- F. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association.
- G. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.
- H. SCAQMD 1113 - South Coast Air Quality Management District Rule No.1113.
- I. SSPC-SP 6 - Commercial Blast Cleaning.

1.3 SUBMITTALS

- A. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
 - 2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- B. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
- C. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, care and cleaning instructions, touch-up procedures, and repair of painted and finished surfaces.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
 - 2. Label each container with color in addition to the manufacturer's label.
- E. VOC Submittals:
 - 1. Product Data for field-applied primers, paints and coatings, including printed statement of Product Type and VOC content, and current limit as published by Maryland Department of the Environment, COMAR 26.11.39.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience and approved by manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.6 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.
- D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints: Provide products by one of the following manufacturers:
 - 1. Base Manufacturer: Sherwin-Williams Company: www.sherwin-williams.com unless noted otherwise.
 - 2. PPG Paints: www.ppgpaints.com/#sl.
 - 3. Benjamin Moore & Company: www.benjaminmoore.com.
- C. Primer Sealers: Same manufacturer as top coats.

2.2 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.

1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Flammability: Comply with applicable code for surface burning characteristics.
- C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- D. Colors: As indicated on drawings.
1. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.3 PAINT SYSTEMS - INTERIOR

- A. Paint I-OP-MD Medium Duty: For surfaces subject to frequent contact by occupants, including surfaces listed below:
1. Medium duty applications include doors, door frames, railings, handrails, guardrails, balustrades, and other metal surfaces not included in other Sections.
 2. Two top coats and one coat primer.
 3. Top Coat(s): Interior Light Industrial Coating, Water Based.
 - a. Products:
 - 1) Sherwin-Williams Pro Industrial Acrylic Coating, Semi-Gloss.
 4. Top Coat Sheen:
 - a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
 5. Primer: As recommended by top coat manufacturer for specific substrate.

6. Top Coat Minimum Volume Solids: 33%
- B. Paint I-OP-FL - Concrete Floors to be Painted.
 1. Two top coats and one coat primer.
 2. Top Coat Sheen:
 - a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.

2.4 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
 1. Concrete Floors and Traffic Surfaces: 8 percent.

3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing paints or finishes that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

- G. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions.
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- F. Sand wood and metal surfaces lightly between coats to achieve required finish.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 96 00 - HIGH-PERFORMANCE COATINGS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. High performance coatings.
- B. Surface preparation.

1.2 REFERENCE STANDARDS

- A. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.
- B. SSPC-SP 1 - Solvent Cleaning.
- C. SSPC-SP 2 - Hand Tool Cleaning.
- D. SSPC-SP 6 - Commercial Blast Cleaning.

1.3 SUBMITTALS

- A. Product Data: Provide complete list of all products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. Cross-reference to specified coating system(s) product is to be used in; include description of each system.
- B. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
- C. Manufacturer's Certificate: Certify that high-performance coatings comply with VOC limits specified.
- D. Maintenance Data: Include cleaning procedures and repair and patching techniques.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Coating Materials: 1 gallon of each type and color.
 - 2. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum ten years documented experience.

- B. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.6 FIELD CONDITIONS

- A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the coating product manufacturer.
- C. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.
- D. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.
- F. Restrict traffic from area where coating is being applied or is curing.

1.7 WARRANTY

- A. Correct defective Work within a five year period after Date of Substantial Completion.
- B. Warranty: Include coverage for bond to substrate.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Provide high performance coating products from the same manufacturer.
- B. High-Performance Coatings: Provide products by one of the following manufacturers:
 - 1. Tnemec Company, Inc: www.tnemec.com/#sle.

2.2 HIGH-PERFORMANCE COATINGS

- A. Primer (low stress penetrating epoxy sealer): Series 108 ProBond
 - 1. Volume Solids: 100%
 - 2. VOC: 0.02 lbs/gallon
- B. Finish Coat (2-component waterborne epoxy): Series 288 Enviro-Pox
 - 1. Volume Solids: 63.3 +/- 2.0%
 - 2. VOC: 0.02 lbs/gallon
- C. Primer (waterbore modified polyamine epoxy): Series 151-1051 Elasto-Grip FC
 - 1. Volume Solids: 17% +/- 2.0%
 - 2. VOC: 1.46 lbs/gallon
- D. Finish Coat (HDP acrylic polymer): Series 1029 Enduratone
 - 1. Volume Solids: 40.0% +/- 2.0%
 - 2. VOC: 0.66 lbs/gallon

2.3 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.
- B. Patching and Fill Material: Resinous product of or approved by manufacturer and recommended by manufacturer for application indicated.
- C. Joint Sealant: Type recommended or produced by manufacturer for type of service and joint condition indicated.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Do not begin application of coatings until substrates have been properly prepared.
- C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.
- D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- E. Test shop-applied primer for compatibility with subsequent cover materials.

- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Cementitious Substrates: Do not begin application until substrate has cured 28 days minimum and measured moisture content is not greater than 12 percent.
 2. Plaster and Stucco: 12 percent.
 3. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
 4. Concrete Floors and Traffic Surfaces: 8 percent.
- G. Proceed with coating application only after unacceptable conditions have been corrected.

3.2 PREPARATION

- A. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.
- B. Clean surfaces of loose foreign matter.
- C. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.
- D. Remove finish hardware, fixture covers, and accessories and store.
- E. Existing Painted and Sealed Surfaces:
1. Remove loose, flaking, and peeling paint. Feather edge and sand smooth edges of chipped paint.
 2. Clean with mixture of trisodium phosphate and water to remove surface grease and foreign matter.
- F. Concrete:
1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi at 6 to 12 inches. Allow to dry.
 3. Prepare surface as recommended by coating manufacturer and according to SSPC-SP 13.
- G. Masonry:
1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.

2. Prepare surface as recommended by coating manufacturer.
3. Uniformly scarify existing glazed block to provide a consistent profile/scratch pattern over 100% of the surface.

H. Galvanized Surfaces:

1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
2. Prepare surface according to SSPC-SP 2.

I. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning", and protect from corrosion until coated.

J. Gypsum Surfaces:

1. Finish joints and fasteners on new gypsum board or patch with Durabond 90 or similar wet environment suitable joint compound.

3.3 PRIMING

- A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.4 COATING APPLICATION

- A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified.
- B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.5 FIELD QUALITY CONTROL

- A. Engage manufacturer's technical representative to provide technical assistance and guidance for surface preparation and application of coating systems.

3.6 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

- B. Clean surfaces immediately of overspray, splatter, and excess material.
- C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.7 PROTECTION

- A. Protect finished work from damage.

3.8 SCHEDULE

- A. Glazed Block
 - 1. Primer: Series 108 ProBond at 1.0-2.0 mils
 - 2. First Coat: Series 288 Enviro-Pox at 2.0-4.0 mils DFT
 - 3. Finish Coat: Series 288 Enviro-Pox at 2.0-4.0 mils DFT
- B. Existing, Painted Gypsum Wall Board, and CMU
 - 1. Spot Primer (bare substrate or peeled areas): Series 288 EnviroPox at 3.0-5.0 mils DFT
 - 2. Finish Coat: Series 288 EnviroPox at 3.0-5.0 mils DFT
- C. New Gypsum Wall Board
 - 1. Primer: Series 151-1051 Elasto-Grip FC at 0.7-1.5 mils DFT
 - 2. First Coat: Series 288 Enviro-Pox at 2.0-4.0 mils DFT
 - 3. Finish Coat: Series 288 Enviro-Pox at 2.0-4.0 mils DFT
- D. Previously Painted Concrete Ceilings
 - 1. First Coat: Series 1029 Enduratone at 2.0-4.0 mils DFT
 - 2. Second Coat: Series 1029 Enduratone at 2.0-4.0 mils DFT

END OF SECTION

SECTION 10 14 19 - DIMENSIONAL LETTER SIGNAGE**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Dimensional letter signage.

1.2 SUBMITTALS

- A. Product Data: Manufacturer's product literature for each type of dimensional letter sign, indicating style, font, colors, locations, and overall dimensions of each sign.
- B. Shop Drawings:
 - 1. Include dimensions, locations, elevations, materials, text and graphic layout, and attachment details.
- C. Samples: Submit one sample of each type of dimensional letter sign of size similar to that required for project, indicating sign style, font, and method of attachment.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

PART 2 PRODUCTS**2.1 DIMENSIONAL LETTERS**

- A. Applications: Entryway signage.
 - 1. Use individual metal letters.
 - 2. Mounting Location: Exterior as indicated on drawings.
- B. Metal Letters:
 - 1. Material: Stainless steel sheet, flat.
 - 2. Thickness: 1/4 inch minimum.
 - 3. Text and Typeface:
 - a. Character Font: Helvetica, Arial, or other sans serif font.
 - b. Character Case: Upper case only.
 - 4. Finish: Brushed, satin.
 - 5. Color: As selected.

6. Mounting: Concealed standoffs.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install with horizontal edges level.
- C. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 14 23 - PANEL SIGNAGE**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Panel signage.

1.2 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.
- B. Shop Drawings:
 - 1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
- C. Samples: Submit two samples of each type of sign, of size similar to that required for project, indicating sign style, font, and method of attachment.
- D. Selection Samples: Where colors, materials, and finishes are not specified, submit two sets of color selection charts or chips.
- E. Verification Samples: Submit samples showing colors, materials, and finishes specified.
- F. Manufacturer's qualification statement.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Panel Signage:
 - 1. Best Sign Systems, Inc: www.bestsigns.com/#sle.
 - 2. FASTSIGNS International, Inc: www.fastsigns.com/#sle.
 - 3. Inpro Corporation: www.inprocorp.com/#sle.

4. Mohawk Sign Systems, Inc: www.mohawksign.com/#sle.

2.2 REGULATORY REQUIREMENTS

- A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.3 PANEL SIGNAGE

- A. Panel Signage:
 1. Application: Room and door signs.
 2. Description: Flat signs with engraved panel media, tactile characters.
 3. Sign Size: 4 inches by 6 inches.
 4. Total Thickness: 1/8 inch.
 5. Color and Font, unless otherwise indicated:
 - a. Character Font: Helvetica, Arial, or other sans serif font.
 - b. Character Case: Upper and lower case (title case).
 - c. Background Color: Selected by Architect from manufacturer's standard colors.
 - d. Character Color: Contrasting color.
 6. Profile: Flat panel without frame.
 7. Tactile Letters: Raised 1/32 inch minimum.
 8. Braille: Grade II, ADA-compliant.
 9. Suspended Mounting: Stainless steel suspension cables, cable clamps, and ceiling fastener suitable for attachment to ceiling construction indicated.
 10. One-Sided Wall Mounting: Concealed screws.

2.4 SIGNAGE APPLICATIONS

- A. Room and Door Signs:
 1. Office Doors: Identify with room names and numbers to be determined later, not those indicated on drawings; provide "window" section for replaceable occupant name.
 2. Conference and Meeting Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings; provide "window" section with sliding "In Use/Vacant" indicator.

3. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
 4. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.
- B. Interior Directional and Informational Panel Signs:
1. Where suspended, ceiling mounted, or projecting from wall signs are indicated, provide two-sided signs with same information on both sides.

2.5 ACCESSORIES

- A. Concealed Screws: Noncorroding metal; stainless steel.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install with horizontal edges level.
- C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 21 13.19 - PLASTIC TOILET COMPARTMENTS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Solid plastic toilet compartments.
- B. Urinal screens.
- C. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.3 SUBMITTALS

- A. Product Data: Provide data on panel construction, hardware, and accessories.
- B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- C. Samples: Submit two samples of partition panels, 4 by 4 inch in size illustrating panel finish, color, and sheen.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Solid Plastic Toilet Compartments:
 - 1. ASI Global Partitions: www.asi-globalpartitions.com/#sle.
 - 2. Hadrian; Hadrian - Standard Series - Plastic: www.hadrian-inc.com/#sle.
 - 3. Scranton Products (Santana/Comtec/Capital):
www.scrantonproducts.com/#sle.

2.2 PLASTIC TOILET COMPARTMENTS

- A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted headrail-braced.
 - 1. Color: As selected by architect from manufacturer's full range.
 - 2. Doors:
 - a. Thickness: 1 inch.
 - b. Width: 24 inch.

- c. Width for Handicapped Use: 36 inch, out-swinging.
- d. Height: 55 inch.
- 3. Panels:
 - a. Thickness: 1 inch.
 - b. Height: 55 inch.
 - c. Depth: As indicated on drawings.
- 4. Pilasters:
 - a. Thickness: 1 inch.
 - b. Width: As required to fit space; minimum 3 inch.
- 5. Urinal Screens: Without doors; to match compartments; mounted to wall with continuous panel brackets.
 - a. Thickness: 1 inch.
 - b. Width: 18 inches, minimum. Screen must terminate 6 inches, minimum, beyond tip of urinal.
 - c. Height: 48 inches and mounted 12 inches off the ground as required to meet ADA.

2.3 ACCESSORIES

- A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor fastenings.
- B. Head Rails: Extruded aluminum, anti-grip profile.
 - 1. Size: Manufacturer's standard size.
- C. Wall and Pilaster Brackets: Stainless steel; continuous type.
- D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
 - 1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.
- E. Hinges: Stainless steel, manufacturer's standard finish.
 - 1. Continuous-type piano hinge, self closing.
- F. Door Hardware: Stainless steel, manufacturer's standard finish.
 - 1. Door Latch: Slide type with exterior emergency access feature.
 - 2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.

3. Provide door pull for outswinging doors.

G. Coat Hook with Rubber Bumper: One per compartment, mounted on door.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
- E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.3 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

3.4 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
- C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Commercial toilet accessories.
- B. Commercial shower and bath accessories.
- C. Under-lavatory pipe supply covers.
- D. Electric hand/hair dryers.
- E. Diaper changing stations.
- F. Locker room benches
- G. Utility room accessories.

1.2 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- C. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- D. ASTM C1036 - Standard Specification for Flat Glass.
- E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.4 SUBMITTALS

- A. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. American Specialties, Inc: www.americanspecialties.com/#sle.

2. Bradley Corporation: www.bradleycorp.com/#sle.
 3. Bobrick Washroom Equipment Inc.: www.bobrick.com.
- B. Provide products of each category type by single manufacturer.

2.2 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
1. Grind welded joints smooth.
- B. Keys: Provide two keys for each accessory to Owner; master key lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.
- E. Adhesive: Two component epoxy type, waterproof.
- F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
- G. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.
- H. Phenolic Core Panels: Nonporous phenolic resin and paper core formed under high pressure, with natural colored finished edges, integral melamine surface, matte finish, and uniform surface appearance; glued laminated panels are not acceptable.
1. Surface Burning Characteristics: Flame spread index of 75 or less, and smoke developed index of 450 or less; when tested in accordance with ASTM E84.

2.3 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.
- B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.
- C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.
- D. Powder-Coated Steel: Clean, degrease, and neutralize. Follow immediately with a phosphatizing treatment, prime coat, and two finish coats of powder coat enamel.
- E. Back paint components where contact is made with building finishes to prevent electrolysis.

2.4 COMMERCIAL TOILET ACCESSORIES

- A. Toilet Paper Dispenser: Double roll, surface mounted bracket type, stainless steel.
1. Products:
 - a. Bobrick ConturaSeries Surface-Mounted Multi-Roll Toilet Tissue Dispenser B-4288.
- B. Automated Soap Dispenser: Foam soap dispenser, deck-mounted on vanity, with container concealed below deck; chrome-plated brass with bright polished finish; chrome-plated deck escutcheon.
1. Minimum Capacity: 27 ounces.
 2. Power: AC power adapter.
- C. Mirrors: Stainless steel framed, 1/4 inch thick tempered safety glass; ASTM C1048.
1. Size: As indicated on drawings.
 2. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
 3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
- D. Grab Bars: Stainless steel, peened surface.
1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force, minimum.
 - b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
 - c. Finish: Satin.
 - d. Length and Configuration: As indicated on drawings.
- E. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
1. Products:
 - a. ASI Surface-Mounted End Stall Sanitary Napkin Disposal, Model #0473-1A.

2.5 COMMERCIAL SHOWER AND BATH ACCESSORIES

- A. Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for installation with exposed fasteners.
- B. Shower Curtain:
 - 1. Material: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
 - 2. Size: 36 by 72 inches, hemmed edges.
 - 3. Grommets: Stainless steel; pierced through top hem on 6 inch centers.
 - 4. Color: White.
 - 5. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
- C. Folding Shower Seat: Wall-mounted surface; welded tubular seat frame, structural support members, swing-down legs, hinges, and mechanical fasteners of Type 304 stainless steel, L-shaped, right hand seat.
 - 1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of color as selected.
 - 2. Size: ADA Standards compliant.
 - 3. Products:
 - a. Bobrick Reversible Solid Phenolic Folding Shower Seat - B-5181
- D. Robe Hook: Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.

2.6 UNDER-LAVATORY PIPE AND SUPPLY COVERS

- A. Under-Lavatory Pipe and Supply Covers:
 - 1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
 - 2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
 - 3. Color: White.
 - 4. Location: Provide at each restroom lavatory.

2.7 ELECTRIC HAND/HAIR DRYERS

- A. Electric Hand Dryers: Traditional fan-in-case type, with downward fixed nozzle.
 - 1. Operation: Automatic, sensor-operated on and off.

2. Mounting: Semi-recessed.
3. Accessories: ADA-Compliant Recess Kit; Model #40502; 304 stainless steel.
4. Cover: Stainless steel with brushed finish.
 - a. Tamper-resistant screw attachment of cover to mounting plate.
5. Electric Hair Dryer Products:

2.8 DIAPER CHANGING STATIONS

- A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
 1. Material: Polyethylene.
 2. Mounting: Surface.
 3. Color: Gray.
 4. Products:

2.9 LOCKER ROOM BENCHES

- A. Locker Benches: Stationary type; bench top of phenolic material; painted steel pedestals.
 1. Accessibility: Comply with ICC A117.1 and ADA Standards.
 2. Exterior bench shall be bolted to concrete slab.

2.10 UTILITY ROOM ACCESSORIES

- A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
 1. Drying rod: Stainless steel, 1/4 inch diameter.
 2. Hooks: Three, 0.06 inch stainless steel rag hooks at shelf front.
 3. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
 4. Length: Manufacturer's standard length for number of holders/hooks.
 5. Location: Provide one at each Janitor's Closet.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.

- B. Verify exact location of accessories for installation.
- C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
- D. Verify that field measurements are as indicated on drawings.

3.2 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.4 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.2 REFERENCE STANDARDS

- A. NFPA 10 - Standard for Portable Fire Extinguishers.

1.3 SUBMITTALS

- A. Product Data: Provide extinguisher ratings and classifications.
- B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Fire Extinguishers:
 - 1. Ansul, a Tyco Business; Cleanguard: www.ansul.com/#sle.
 - 2. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
 - 3. Nystrom, Inc: www.nystrom.com/#sle.
- B. Fire Extinguisher Cabinets and Accessories:
 - 1. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
 - 2. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
 - 3. Nystrom, Inc: www.nystrom.com/#sle.

2.2 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Class: A:B:C type.
 - 2. Size: 10 pound.
 - 3. Finish: Baked polyester powder coat, color as selected.

4. Temperature range: Minus 40 degrees F to ____ degrees F.

2.3 FIRE EXTINGUISHER CABINETS

- A. Cabinet Construction: Non-fire rated.
 1. Formed stainless steel sheet; 0.036 inch thick base metal.
- B. Cabinet Configuration: Surface mounted type.
 1. Size to accommodate accessories.
 2. Trim: Flat square edge, with 1 - 2 inch wide face.
- C. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.
- D. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- E. Fabrication: Weld, fill, and grind components smooth.
- F. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.
- G. Finish of Cabinet Interior: White colored enamel.

2.4 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.
- B. Lettering: FIRE EXTINGUISHER decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Place extinguishers in cabinets.

END OF SECTION

SECTION 10 51 26
PLASTIC LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Solid plastic lockers.
- B. Locker benches.

1.02 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. ICC A117.1 - Accessible and Usable Buildings and Facilities.
- C. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's published data on locker construction, sizes and accessories.
- B. Shop Drawings: Indicate locker plan layout, numbering plan.
- C. Samples: Submit two samples 3 by 6 inches in size, of each color selected.
- D. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Solid Plastic Lockers:
 - 1. Bradley: Standard Locker - LenoxLocker

2.02 LOCKER APPLICATIONS

- A. All Lockers: Solid plastic lockers, wall mounted for base indicated on drawings.
 - 1. Width: 15 inches.
 - 2. Depth: 18 inches.

3. Height: 72 inches.
 4. Locker Configuration: Four tier.
 5. Fittings: Size and configuration as indicated on drawings and below.
 - a. Hooks: One double prong. Provide one per locker.
 6. Locking: Padlock hasps.
 7. Provide sloped top.
- B. Locker Benches: Stationary type; bench top of solid high density polyethylene (HDPE); painted steel pedestals. Size as indicated on drawings.
- C. Locker Bench Support Brackets: Welded structural aluminum single arm floor mount pedestal bench support brackets; pre-drilled for bench top material attachment and for floor anchorage.
1. Accessibility: Comply with ICC A117.1 and ADA Standards.
 2. Finish: Black powdercoat.

2.03 SOLID PLASTIC LOCKERS

- A. Lockers: Factory assembled, made of solid plastic panels, tested in accordance with NFPA 286, homogenous color throughout.
1. Material: Solid high density polyethylene (HDPE).
 2. Doors: Full overlay without frame.
 3. Locker Body Construction: Manufacturer's standard for selected product.
 4. Where locker ends or sides are exposed, provide same finish as fronts or provide extra panels to match fronts.
 5. Provide filler strips where indicated, securely attached to lockers.
 6. Door Color: To be selected by Architect.
 7. Body Color: Manufacturer's standard white or light color.
- B. Component Thicknesses:
1. Doors: 1/2 inch minimum thickness.
 2. Locker Body: Tops, bottoms, backs, and shelves 3/8 inch minimum.
 3. End Panels and Filler Panels: 1/2 inch minimum thickness.

- 4. Sloped Tops: 1/2 inch minimum thickness.
- C. Hinges: Full height of locker, manufacturer's standard heavy duty type.
- D. Number Plates: Provide rectangular shaped aluminum plates. Form numbers 1 inch high of block font style with ADA designation, in contrasting color.
- E. Built-In Lock Boxes: Same material as locker, manufacturer's standard size, with padlock hasps, for padlocks provided by Owner.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Place and secure on prepared base.
- C. Install lockers plumb and square.
- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.
- E. Install end panels, filler panels, and sloped tops.
- F. Install fittings if not factory installed.
- G. Replace components that do not operate smoothly.

3.02 CLEANING

- A. Clean locker interiors and exterior surfaces.

END OF SECTION 10 51 26

SECTION 10 56 13 - METAL STORAGE SHELVING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Four post shelving.
- B. Shelving accessories.

1.2 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Rated uniform shelf loads.
 - 2. Details of shelving assemblies, including reinforcement.
 - 3. Accessories.
 - 4. Installation methods.
- B. Test Reports: Provide independent agency test reports documenting compliance with specified structural requirements.
- C. Shop Drawings: Indicate location, type, and layout of shelving, including lengths, heights, and aisle layout, and relationship to adjacent construction.
 - 1. Indicate methods of achieving specified anchoring requirements.
- D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and finishes.
- E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inspect for dents, scratches, or other damage. Replace damaged units.
- B. Store in manufacturer's unopened packaging until ready for installation.
- C. Store under cover and elevated above grade.

1.6 WARRANTY

- A. Provide one year manufacturer warranty covering defects of manufacturing and workmanship and rust and corrosion.

PART 2 PRODUCTS**2.1 MANUFACTURERS**

- A. Four Post Shelving:
 1. ASI Storage Solutions: www.asi-storage.com/#sle.
 2. Hallowell: www.hallowell-list.com/#sle.
 3. Montel; SmartShelf: www.montel.com/#sle.
 4. Penco Products, Inc: www.pencoproducts.com/#sle.
 5. SpaceSaver Corporation: www.spacesaver.com/#sle.

2.2 SHELVING - GENERAL

- A. See drawings for layout and sizes.

2.3 FOUR POST SHELVING

- A. Four Post Shelving: Steel post-and-beam type with sway bracing, shelving brackets, shelving surfaces, and accessories as specified.
 1. Unit Width: 24 inches, center to center of posts.
 2. Shelf Capacity: Uniform distributed load of 50 psf, minimum.
 3. Shelf Depth: 24 inches, minimum.
 4. Finish: Baked enamel, medium gloss.
 5. Color: As selected by Architect from manufacturer's standard range.
 6. Number of Units: As indicated on drawings.
- B. Posts and Beams: Formed sheet members; perforations exposed on face of members are not acceptable.
 1. Metal Thickness: 16 gauge, 0.0598 inch.
 2. Post Shape: Tee intermediate posts, angle end posts forming corners.
 3. Post Face Width: 2 inches, maximum.
 4. Connecting Hardware: Manufacturer's standard.
- C. Bracing: Formed sheet members.
 1. Back Sway Bracing: Either strap or panel; at back of each unit.

- 2. Side Sway Bracing: Either strap or panel; at each side of each unit.
- 3. Strap Sway Bracing: One strap installed diagonally, 16 gauge, 0.0598 inch; welded, riveted, or bolted to uprights.
- 4. Panel Sway Bracing: Formed sheet metal panels, 20 gauge, 0.0359 inch; welded, riveted, or bolted to uprights.
- D. Shelves: Formed sheet, finished on all surfaces , with slots for dividers.
 - 1. Metal Thickness: 16 gauge, 0.0598 inch.
 - 2. Shelf Connection to Posts: Manufacturer's standard.

2.4 ACCESSORIES

- A. Label Holders: Steel, attached to front face of shelf.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate is level and that clearances are as specified.
- B. Do not begin installation until substrates have been properly prepared.
- C. 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.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install shelving with shelf surfaces level and vertical supports plumb; adjust feet and bases as required.
- C. Out-Of-Square Tolerance - Four Post Shelving: Maximum of 1/8 inch difference in distance between bottom shelf and canopy top, measured along any post in any direction.

3.4 CLEANING

- A. Clean shelving and surrounding area after installation.

3.5 PROTECTION

- A. Protect installed products until completion of project.

- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 11 52 13 - PROJECTION SCREENS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Front projection screen assemblies.

1.2 SUBMITTALS

- A. Product Data: Manufacturer's catalog cuts and descriptive information on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Manufacturer's Qualification Statement.
- C. Installer's Qualification Statement.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

PART 2 PRODUCTS

2.1 FRONT PROJECTION SCREENS

- A. Front Projection Screens: Factory assembled unless otherwise indicated.
 - 1. Dimensions: As indicated on drawings.
- B. Matte Light Diffusing Fabric: Light diffusing screen fabric; washable, flame retardant and mildew resistant.
- C. Masking Borders: White, on four sides.
- D. Extra Drops: White; 11 inch wide.
- E. Exposed Screen Cases: Steel, with integral roller brackets.
 - 1. Finish: Baked enamel.
 - 2. Color: White.
 - 3. End Caps: Steel; finished to match case.
 - 4. Provide wall valance to hide screen case when not in use.

5. Mounting: Wall.
- F. Manually-Operated Screens:
1. Roller: 1-3/4 inch aluminum; spring loaded with locking device.
 2. Screen Pull: Ring on bottom bar.
 3. Vertical Tensioning: Screen fabric weighted at bottom with steel bar and plastic end caps.
- G. Provide mounting hardware, brackets, supports, fasteners, and other mounting accessories required for a complete installation, in accordance with manufacturer's recommendations for specified substrates and mountings.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate screen installation with installation of projection systems.
- B. Coordinate installation with adjacent construction and fixtures, including ceilings, walls, lighting, fire suppression, and registers and grilles.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions, using manufacturer's recommended hardware for relevant substrates.
- B. Do not field cut screens.
- C. Install screens in mountings as specified and as indicated on drawings.
- D. Install plumb and level.
- E. Adjust projection screens and related hardware in accordance with manufacturer's instructions for proper placement and operation.

END OF SECTION

SECTION 12 36 00 - COUNTERTOPS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Countertops for architectural cabinet work.

1.2 REFERENCE STANDARDS

- A. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0.
- D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material.
- E. NEMA LD 3 - High-Pressure Decorative Laminates.

1.3 SUBMITTALS

- A. 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. Specimen warranty.
- B. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
- C. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

PART 2 PRODUCTS**2.1 COUNTERTOPS**

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

- B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
1. Flat Sheet Thickness: 1/2 inch, minimum.
 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers:
 - 1) Dupont: www.corian.com/#sl.
 - b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - c. Color and Pattern: As selected by Architect from manufacturer's full line.
 3. Other Components Thickness: 1/2 inch, minimum.
 4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge; use marine edge at sinks.
 5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.

2.2 MATERIALS

- A. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.
- B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- C. Joint Sealant: Mildew-resistant silicone sealant, clear.

2.3 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 1. Join lengths of tops using best method recommended by manufacturer.
 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.

1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 2. Height: 4 inches, unless otherwise indicated.
- C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
1. Integral sinks: Shop-mount securely to countertop with adhesives, using flush configuration, as per manufacturer's instructions, and as detailed on drawings.

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.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.2 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Seal joint between back/end splashes and vertical surfaces.

3.3 CLEANING

- A. Clean countertops surfaces thoroughly.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 22 00 00 – BASIC PLUMBING REQUIREMENTS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section and all other sections of Division 22.

1.2 SUMMARY

- A. This Section includes the requirements for the following:
1. Codes, organizations, standards, and abbreviations
 2. Responsibility
 3. Site Visit
 4. Submittals
 5. Variances
 6. Performance requirements
 7. Material and equipment
 8. Coordination, sequencing and scheduling
 9. Demolition
 10. Fire safe materials
 11. UL requirements
 12. Warranty / Guarantee
 13. Listed manufacturers
 14. Approved equal equipment layouts
 15. Construction record documents.
 16. Operation and maintenance manuals
 17. Grout
 - 18.
 19. General requirements - Execution
 20. Equipment roughins
 21. Mechanical installation - Plumbing
 22. Cutting and patching

23. Cutting, welding and burning
24. Painting and finishing
25. Concrete bases
26. Erection of metal supports and anchorage
27. Demolition
28. Grout
29. Penetration of water proof construction
30. Excavation and backfilling
31. Cleaning and Finishes
32. Lintels
33. Electrical requirements
34. Provisions for access
35. Operation of equipment
36. Demonstration and instructions
37. Lubrication
38. Wall and floor penetrations
39. Construction record drawings
40. Closeout procedures
41. Clean up
42. Project punchout

1.3 CODES, ORGANIZATIONS, STANDARDS AND ABBRIVIATIONS

- A. The following list of codes, organizations, standards and abbreviations are utilized within Division 22 Specification Sections and are provided as a reference.
- B. Codes: All material and equipment provided and installed as part of these construction documents shall be in compliance with the latest edition of the following codes as adapted by the State of Maryland for the following codes:
 1. IBC: International Building Code
 2. IMC: International Mechanical Code
 3. IECC: International Energy Conservation Code
 4. NEC: National Electrical Code
 5. NFPA: National Fire Protection Association

6. International Plumbing Code (IPC)
- C. Organizations and Standards: The list of organizations and standards are as follows:
1. ADA: American National Standards Institute
 2. AGA: American Gas Association
 3. ANSI: American National Standards Institute
 4. ASHRAE: American Society of Heating Refrigeration and Air Conditioning Engineers
 5. ASME: American Society of Mechanical Engineers
 6. ASSE: American Society of Safety Engineers
 7. ASTM: American Society for Testing and Materials
 8. AWS: American Welding Society
 9. AWWA: American Water Works Association
 10. CDA: Copper Development Association Inc.
 11. CFR; Code of Federal Regulations
 12. CGA: Compressed Gas Association
 13. CISPI: Cast Iron Soil Pipe Institute
 14. CS: Commercial Standard
 15. CSA: Canadian Standards Association
 16. EJMA: Expansion Joint Manufacturers Association
 17. EPA: Environmental Protection Agency
 18. FDA: Food and Drug Administration
 19. FSA: Fuel Sealing Association
 20. IAPMO: International Association of Plumbing and Mechanical Officials
 21. IBC: International Building Code
 22. IBR: Institute of Boiler and Radiator Manufacturers
 23. ICC: International Code Council
 24. ICC-ES: International Conference on Computational & Experimental Engineering and Sciences
 25. IEEE: Institute of Electrical and Electronics Engineers
 26. ITT: International Telephone & Telegraph Corporation
 27. LED: Light Emitting Diode

28. MFMA: Metal Framing Manufacturers Association
 29. MIL: Military Standard
 30. MOSHA: Maryland Occupational Safety and Health Administration
 31. MSS: Manufacturers Standardization Society
 32. MSS SP: Manufacturers Standardization Society Standard Practice
 33. NEMA: National Electrical Manufacturers Association
 34. NEMA MG: National Electrical Manufacturers Association Motors & Generators
 35. NFPA: National Fire Protection Association
 36. NICET: National Institute for Certification in Engineering Technologies
 37. NSF: National Sanitation Foundation
 38. NRTL: Nationally Recognized Testing Laboratory
 39. OSHA: Occupational Safety and Health Administration
 40. OSHPD: Office of Statewide Health Planning and Development
 41. PDI: Plumbing and Drainage Institute
 42. SE: Safety Engineering
 43. SEI: Software Engineering Institute
 44. SSPC: Society for Protective Coatings
 45. USP - NF: The United States Pharmacopeia and The National Formulary
- D. Abbreviations: The list of abbreviations are as follows:
1. AEC: Architecture, Engineering and Construction
 2. ASJ: All Service Jacket
 3. AWF: All Weather Finish
 4. AWG: American Wire Gauge
 5. CAD: Computer Aided Design
 6. CD-ROM: Compact Disk – Read Only Material
 7. CM: Construction Manager
 8. CWP: Cold Working Pressure
 9. °C: Degree Celsius
 10. °F: Degree Fahrenheit

11. Dwg: Drawing
12. DOC: Document
13. Dwg: Drawing
14. EPDM: Ethylene Propylene Diene Terpolymer Rubber
15. FNPT: Female National Pipe Thread
16. FSK: Foil-Scrim-Kraft
17. FT: Foot, Feet
18. GC: Glass Cloth
19. g/L: Gram per Liter
20. GPH: Gallons per Hour
21. HCFC: Hydrochlorofluorocarbons
22. HNBR: Hydrogenated Nitrile Butadiene Rubber
23. HP: Horse Power
24. HVAC: Heating Ventilation and Air Conditioning
25. Hz: Hertz
26. ID: Inside Diameter
27. IEQ: Indoor Environmental Quality
28. IN: Inches
29. kPa: Kilopascal
30. Lb/ft: Pound-Foot
31. LED: Light Emitting Diode
32. LF: Linear Feet
33. LLDPE: Linear Low Density Polyethylene Resins
34. MAX: Maximum
35. MER: Mechanical Equipment Room
36. MIN: Minimum
37. mPa: Megapascal
38. N/A: Not Applicable
39. NBR: Acrylonitrile-Butadiene, Buna-N, or Nitrile Rubber

- 40. NOM: Nominal
- 41. NON: Not In
- 42. NPS: Nominal Pipe Size
- 43. NPT: National Pipe Thread
- 44. NRS: Nonrising Stem
- 45. OD: Outside Diameter
- 46. OS&Y: Outside Screw and Yoke
- 47. OXY: Oxygen
- 48. Pdf: Portable Document Format
- 49. PE: Polyethylene
- 50. PSI: Pounds per Square Inch
- 51. PSIG: Pounds per Square Inch Gage
- 52. PVC: Polyvinyl Chloride
- 53. RO/DI: Reverse Osmosis/Distilled Water
- 54. RS: Rising Stem
- 55. UV: Ultraviolet
- 56. V: Volt
- 57. VAC: Vacuum
- 58. VOC: Volatile organic compounds

1.4 RESPONSIBILITY

- A. The Construction Manager/General Contractor (CM/GC) shall be responsible for all work included in Division 22. The delegation of work to the contractors shall not relieve them of this responsibility. Contractors who perform work under this Division shall be responsible to the CM/GC.

1.5 SITE VISIT

- A. Prior to preparing the bid, the mechanical plumbing subcontractor shall visit the site and become familiar with all existing conditions. Make all necessary investigations as to locations of utilities and all other matters which can affect the work. No additional compensation will be made to the contractor as a result of his failure to familiarize himself with the existing conditions under which the work must be performed.

1.6 SUBMITTALS

- A. General: For general requirements see Architectural Specification Division 01 Section "Submittal Procedures".

B. Provide submittals for all material, equipment and/or supports as specified in Division 22 and where indicated on the drawings and details. For material and product data submission requirements see Division 22 Specification Sections. At a minimum the following submittals shall be provided as required by the project unless otherwise noted:

1. Pipe, fittings and accessories for each system.
2. Valves, strainers and unions for each system.
3. Insulation.
4. Hangers and supports.
5. Plumbing fixtures and trim.
6. Safety fixtures and equipment.
7. Identification labels and tags.
8. Floor drains.
9. Roof drains.
10. Hot water heating equipment.
11. Trap priming system.
12. Backflow preventers.
13. Plumbing pumps.
14. Pipe and equipment roof curbs and supports.
15. Coordination drawings.
16. Warranties and maintenance instructions shall be included in the O & M Manual only. Do not include this data in the Product Submittals.

C. Submittal File Format: File formats for each submittal shall be electronically as follows:

1. Product Data: "pdf" file format.
2. Shop Drawings: "pdf" file format.
3. Coordinated Drawings: "pdf" or "dwg" file formats.
4. Schedules: "xl" file format.

1.7 VARIANCES

A. Where variances occur between the drawings and specifications or within either document itself, the item or arrangement of better quality, greater quantity or higher cost shall be included in the contract price. The Engineer shall decide on the item and manner in which the work shall be provided.

1.8 PERFORMANCE REQUIREMENTS

- A. Contract drawings are generally diagrammatic and do not indicate all offsets, fittings, transitions, access panels and other specialties required. Furnish and install all items as may be required to fit the work to the conditions encountered.
- B. Arrange plumbing piping, equipment and other work generally as shown on the contract drawings, providing proper clearances and access.
- C. Where departures are proposed because of field conditions or other causes, prepare and submit detailed shop drawing submittal for approval in accordance with Submittals specified below.
- D. The Architect may make reasonable changes in location of equipment piping and ductwork up to the time of rough-in or fabrication.

1.9 MATERIALS AND EQUIPMENT

- A. The contract drawings and system performances have been designed on the basis of using the particular manufacturer's products specified or scheduled on the contract drawings.
- B. Products of other manufacturer's listed in the specification shall be permitted provided as follows:
 - 1. Products meet all of the requirements of the specifications.
 - 2. Make, without additional cost to the Owner, all adjustments for deviations, such that the final installation is complete and functions as the basis of design product is intended.
- C. Products with dimensions or other characteristics different from the basis of design product that render their use impractical or cause functional fit, access, or connection problems, shall not be acceptable.

1.10 COORDINATION, SEQUENCING AND SCHEDULING

- A. Coordination: Coordinate plumbing systems, equipment, and materials installation with other building components.
- B. Utilities: Coordinate connection of plumbing systems with exterior underground services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- C. Chases: Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- D. Sleeves: Coordinate the installation of required supporting devices and set sleeves in poured in place concrete and other structural components as they are constructed.
- E. Sequencing: Sequence, coordinate, and integrate installations of plumbing material and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.
- F. Electrical Services: Coordinate connection of electrical services.
- G. Access: Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Architectural Specification Section "Access Doors."
- H. Scheduling: Schedule and coordinate the delivery of material and equipment with other trades to avoid delivery conflicts.

1.11 FIRE SAFE MATERIALS

- A. Unless otherwise indicated, materials shall conform to UL, NFPA or ASTM standards for fire safety with smoke and fire hazard rating not exceeding flame spread of twenty five (25) and smoke development of fifty (50).

1.12 UNDERWRITER'S LABORATORY (UL) REQUIREMENTS

- A. All equipment containing electrical components and provided as part of the mechanical specifications shall bear the Underwriter's Laboratory (UL) label, as a complete packaged system.
1. Equipment not provided with a UL label shall be tested in the field, certified and provided with a UL label at the installer's expense.
 2. Field testing shall be performed by a testing agency approved by the authority having jurisdiction.

1.13 WARRANTY/GUARANTEEE

- A. All materials, equipment, etc. provided by the general contractor and/or his subcontractors shall be warranted and guaranteed to be free from defects in workmanship and materials for a period of two (2) years from the date of substantial completion and acceptance of work by the Owner. Any defects in workmanship, materials, or performance which appear within the guarantee period shall be corrected by the contractor without cost to the owner, within a reasonable time, to be specified by the Owner. In default thereof, owner may have such work done and charge the cost of same to the contractor. In addition to the above statement the Warranty/Guarantee Period shall include also all labor cost related to all warranty work. For compressorized equipment include an additional three (3) year Warranty/Guarantee Period.

PART 2 - PRODUCTS**2.1 LISTED MANUFACTURERS:**

- A. Listed Manufacturers: The listed manufacturers indicated in Part 2 of each specification section as the basis of design represents the minimum level of quality for materials and equipment that is acceptable to the Owner. Unless otherwise indicated in each specification section, contractors may submit material and equipment by non listed manufacturers provided said submittals meet all of the requirements of these specifications. All submitted materials and equipment are subject to approval by the A/E.

2.2 APPROVED EQUAL EQUIPMENT LAYOUTS

- A. Approved Equal Equipment Layouts: The equipment layouts and the related mechanical and electrical service connections, access space and supports indicated on the construction documents represent equipment provided by the specified basis of design manufacturer and model number. When the successful bidder chooses to provide "or approved equal" equipment by one (1) of the other listed manufacturers in the specifications, the bidder shall be responsible for providing all adjustments and modifications to the services necessary to make connections to the equipment, the bidder shall be responsible for installing the equipment such that all required clear access space is maintained, and the bidder shall be responsible for providing all adjustments and modifications to the equipment mounting and supports. All adjustments and modifications shall be provided by the bidder and appropriate subcontractors at no additional cost to the project.

2.3 CONSTRUCTION RECORD DOCUMENTS

- A. The mechanical/plumbing contractor shall maintain a set of construction record documents during the construction period in accordance with Specification Division 01 Section "Project Closeout".

2.4 PROJECT OPERATION AND MAINTENANCE MANUAL – ELECTRONIC FILES

- A. Project O & M Manual File: The project OM Manual shall include one (1) electronic copy of each approved submittal and any manufacturer's maintenance manuals, and all warranty certificates included in Division 22. Also include the address, phone number and contact person for each supplier. Insert the submittal files include both a book mark and tree structure for accessing each submittal file in the manual.

2.5 GROUT

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
 1. Characteristics: Post hardening, volume adjusting, dry, hydraulic cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 2. Design Mix: 5,000 psi (34.50MPa), twenty eight (28) day compressive strength.
 3. Packaging: Premixed and factory packaged.

PART 3 – EXECUTION**3.1 GENERAL REQUIREMENTS – EXECUTION**

- A. All construction work that creates excessive noise will not be permitted during normal business hours. See Division 01 Specification Section 01045 "Cutting and Patching" for requirements.

3.2 EQUIPMENT ROUGH IN AND FINAL CONNECTIONS

- A. Locations: Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Rough in Requirements: Refer to equipment specifications included in the architectural, mechanical, and electrical specifications for equipment rough in requirements. Provide final connections for each piece of equipment.
- C. Owner Furnished Equipment: Refer to owner supplies equipment specifications and/or cut sheets for equipment rough in requirements. Provide final connections for each piece of owner supplied equipment.

3.3 MECHANICAL INSTALLATIONS - PLUMBING

- A. Verify all dimensions by field measurements.
- B. Where plumbing systems, materials and equipment are intended for overhead installation, and where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible. Notify the Architect prior to installation of plumbing system components when headroom is less than 7'-6" and/or where existing system

components will be below the new finished ceiling height. Notification shall be through the "RFI" process.

- C. Install plumbing systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, identify the conflict and submit and "RFI" for each conflict to the Architect.
- D. Install plumbing systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components.
- E. Install plumbing equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
- F. Install access panel or doors where material and/or equipment requiring service will be concealed behind finished surfaces. Access panels and doors are specified in the architectural specifications.
- G. Install plumbing systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
- H. The contractor shall confirm that all pressure vessels are installed in full compliance with the requirements of the State Inspector's Office for Boilers and Pressure Vessels. Refer to "Closeout Procedures" in this Section for additional requirements.

3.4 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 01 Specification Section "Cutting and Patching" In addition to the requirements specified in Specification Division 01, the following requirements apply:
 - 1. Patch Materials: Patch finished surfaces and building components using new materials specified for the original installation and using experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
- B. Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to removal of mechanical piping, heating units, ductwork, plumbing fixtures and trim, and other mechanical items made obsolete by the new work.

3.5 CUTTING, WELDING, BURNING

- A. Before the contractor and/or any sub-contractor commences any cutting, welding, burning, brazing (pipe sweating), the contractor shall obtain a hot work permit.
- B. The hot work permit copy shall remain on the job site at the hot work location until such work is completed.

3.6 PAINTING

- A. Refer to Architectural Specification Section "Painting" for field painting requirements.
- B. Damage and Touch Up: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

- C. Do not paint manufacturer's labels or tags.

3.7 CONCRETE BASES

- A. Construct concrete equipment bases of dimensions indicated, but not less than four (4) inches (100 mm) larger than supported unit in both directions. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3,000 psi (20.70MPa), twenty eight (28) day compressive strength concrete and reinforcement bars as specified in the architectural specifications.

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1 "Structural Welding Code--Steel."

3.9 GROUTING

- A. Install nonmetallic nonshrink grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's printed instructions.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms for placement of grout, as required.
- D. Avoid air entrapment when placing grout.
- E. Place grout to completely fill equipment bases.
- F. Place grout on concrete bases to provide a smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout according to manufacturer's printed instructions.

3.10 PENETRATION OF WATERPROOF CONSTRUCTION

- A. Coordinate the work to minimize penetration of waterproof construction, including roofs, exterior walls and interior waterproof construction.
- B. Furnish and install drains, curbs, vent assemblies, sleeves, flashing, etc. specifically designed for application to the particular construction. Install system in accordance with the roofing manufacturer's instructions.

3.11 EXCAVATION AND BACKFILLING

- A. General: Perform all necessary excavation and backfilling necessary for the installation of underground plumbing services as part of Division 22 in accordance with the architectural specifications.

3.12 CLEANING AND FINISHES

- A. Clean surfaces prior to application of insulation, adhesives, coating, and paint.

- B. Provide factory applied finish where specified.
- C. Protect all finishes, and restore all finishes to their original condition if damaged as a result of work installed as part of the mechanical specifications.
- D. Remove all construction marking and writing from exposed equipment, piping and building surfaces.

3.13 LINTELS

- A. Lintels shall be provided for openings in masonry, brick, concrete, etc. walls to accommodate work of this division.
 - 1. Lintels shall be provided under this division when not being provided under other divisions. Lintels shall be approved by the Architect.

3.14 ELECTRICAL REQUIREMENTS

- A. Unless otherwise indicated, furnish and install control and interlock wiring for the equipment furnished under this division. In general, power wiring and motor starting equipment will be provided as specified in the electrical specifications.
 - 1. Where the electrical requirements of the equipment furnished differ from the provisions made in the electrical specifications, make the necessary allowances as part of the mechanical specifications.
 - 2. Where no electrical provisions are included in the electrical specifications, include all necessary electrical work as part of the mechanical specifications.
- B. All electrical work performed as part of the mechanical specifications shall be provided in accordance with the electrical specifications.

3.15 PROVISIONS FOR ACCESS

- A. Furnish and install adequate access to all plumbing components. The following list shall be used as a guide only:
 - 1. Equipment
 - 2. Valves
 - 3. Cleanouts
 - 4. Traps
 - 5. Low point drains
- B. Access shall be adequate as determined by the Architect.
- C. Refer to contract drawings where access panels have been specifically located.
- D. Where access is by means of lift out ceiling tiles or panels mark each access panel using small color coded or numbered tabs. Provide an index chart for identification. Place markers in corner of tile.

3.16 OPERATION OF EQUIPMENT

- A. Clean all systems and equipment prior to initial operation for testing and balancing.
- B. Do not operate equipment unless all proper safety devices or controls are operational.
- C. Provide all maintenance and service for equipment which is operated during construction.
- D. Where specified and otherwise required, provide the services of a manufacturer's factory trained service organization to start the equipment.

3.17 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of equipment and systems to Owner's personnel a minimum two (2) weeks prior to date of final inspection.
 - 1. For equipment requiring seasonal operation, perform instructions for other seasons at the same time.
 - 2. Training period shall be performed within one (1), two (2) week period.
- B. Use operation and maintenance manuals and video as basis of instruction. Review contents of manual and video with personnel in detail to explain all aspects of operation and maintenance.
- C. Demonstrate the following:
 - 1. Start up.
 - 2. Operation.
 - 3. Control.
 - 4. Adjustment.
 - 5. Trouble shooting.
 - 6. Servicing.
 - 7. Maintenance.
 - 8. Shutdown.
- D. Provide at least forty (40) hours straight time instruction to the operating personnel.
 - 1. This instruction period shall consist of not less than five (5) eight (8) hour days.
 - 2. Time of instruction shall be designated by the Owner.
 - 3. This instruction shall be in addition to instructional requirements of specific equipment specified elsewhere in the mechanical specifications.
 - 4. Record all training sessions. Provide the Owner with three (3) copies of the recordings in digital versatile disk (DVD) format.

3.18 LUBRICATION

- A. All bearings, motors and all equipment requiring lubrication shall be provided with accessible fittings.
- B. Before turning over the equipment to the Owner, the Installer shall provide the following:
 - 1. Fully lubricate each item of equipment.
 - 2. Provide one (1) year's supply of lubricant for each type of lubricant.
 - 3. Provide complete written lubricating instructions, together with diagram locating the points requiring lubrication.
- C. Motors and equipment shall be provided with grease lubricated roller or ball bearings with Alemite or equal extended grease fittings and drain plugs.

3.19 WALL AND FLOOR PENETRATIONS

- A. All penetrations of partitions, walls and floors by ducts, piping or conduit under Specification Division 22 shall be sealed and caulked. Provide UL listed fire stopping systems at penetrations through fire walls as specified in the architectural specifications.

3.20 CONSTRUCTION RECORD DRAWINGS

- A. As the work progresses, the contractor shall record on one (1) set of prints, the installed locations, sizes, and depths of pipes, services, equipment, etc. which may differ from the approved contract drawings.
- B. Upon completion of the plumbing system installations, the plumbing contractor shall deliver to the construction manager one (1) complete set of the plumbing system marked-up blueprints of the plumbing contract drawings.
 - 1. The mark-ups shall be legibly marked in red pencil to show all changes and departures of the installation as compared with the original design.
- C. At a minimum include the following installed conditions:
 - 1. Location of all shut off valves, drain valves, and balancing valves with assigned valve tag numbers.
 - 2. Show the location of concealed material and/or equipment requiring service such as strainers, traps, hot water heaters, and/or expansion compensators.
 - 3. Actual entering/leaving invert elevations for domestic water, sanitary, storm water, and natural gas services for the building.
 - 4. Where building services are located below floor slabs show the actual low point invert elevation and the high point invert elevation for gravity piping systems.

3.21 CLOSEOUT PROCEDURES

- A. Operating and Maintenance Instructions: Submit a complete package at least one (1) month prior to substantial completion. Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:

1. Maintenance manuals, including a customized list of preventive maintenance items and annual schedule for maintenance.
 2. Record documents.
 3. Complete inventory of spare parts and materials.
 4. Tools.
 5. Lubricants.
 6. Fuels.
 7. Identification systems.
 8. Control sequences.
 9. Hazards.
 10. Cleaning.
 11. Warranties and bonds.
 12. Maintenance agreements and similar continuing commitments.
- B. As part of instruction for operating equipment, demonstrate the following procedures:
1. Start up.
 2. Shut down.
 3. Emergency operations.
 4. Noise and vibration adjustments.
 5. Safety procedures.
 6. Economy and efficiency adjustments.
 7. Effective energy utilization.

3.22 CLEAN UP

- A. Excessive debris and dirt, such as occurs from cutting through masonry or plaster walls shall be cleaned up from the equipment and removed immediately after the work of cutting through the walls.
- B. Debris shall be removed from the property.
- C. Ceiling panels shall be replaced as soon as work is finished in the area, and shall be kept free of dirty finger prints. Where work is being done in corridors used by patients and ceiling panels shall be replaced at the close of the day's work even if work in the particular location is incomplete.
- D. All areas shall be left broom-clean at the end of the work period.
- E. Remove all mechanical clipping, wiring, nuts, bolts, etc. left on top of ceilings and ceiling tiles.

3.23 PROJECT PUNCH OUT

- A. Architect/Engineer will perform punch out reviews and will provide the Contractor with a list of punch list items to be completed before contract close out. Each and every punch list item shall be initialed and dated by the Contractor when the work is complete. The Architect/ Engineer will not perform any punch list verification until all items have been completed, initialed, dated and the list returned to the Architect/Engineer. If any items have been initialed as being completed by the Contractor and the Architect/Engineer determines that the work is not complete, the Architect/Engineer shall be reimbursed by the Contractor at his regular hourly rate for any and all items requiring revisiting of the site by the Architect/Engineer. Reimbursement shall be made by deducting the Architect/Engineer fee from the Contractor's final payment.

END OF SECTION

SECTION 22 05 13 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 PRODUCTS**2.1 GENERAL MOTOR REQUIREMENTS**

- A. Comply with NEMA MG 1 unless otherwise indicated.
- B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet (1000 m) above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Energy efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.
- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Multispeed Motors: Separate winding for each speed.
- F. Rotor: Random-wound, squirrel cage.
- G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- H. Temperature Rise: Match insulation rating.
- I. Insulation: Class F.
- J. Code Letter Designation:
 - 1. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
- C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be EC motor.
- B. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- C. Motors 1/20 HP and Smaller: Shaded-pole type.
- D. 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 22 05 17 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Stack-sleeve fittings.
 - 3. Sleeve-seal systems.
 - 4. Sleeve-seal fittings.
 - 5. Grout.
 - 6. Silicone sealants.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 PRODUCTS**2.1 SLEEVES**

- A. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop collar.
- B. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized with plain ends and integral welded waterstop collar.
- C. PVC Pipe Sleeves for swimming pool and pool water treatment areas: ASTM D 1785, Schedule 40.

2.2 STACK-SLEEVE FITTINGS

- A. Description: Manufactured, galvanized cast-iron sleeve with integral clamping flange for use in waterproof floors and roofs. Include clamping ring, bolts, and nuts for membrane flashing.
1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

- A. Description:
1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 2. Designed to form a hydrostatic seal of 20 psig (137 kPa) minimum.
 3. Sealing Elements: EPDM-rubber/Nitrile (Buna N) interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 4. Pressure Plates: Stainless steel 316.
 5. Connecting Bolts and Nuts: Stainless steel 316 of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall.
- B. Plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

- A. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.6 SILICONE SEALANTS

- A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant, ASTM C 920, Type S, Grade NS, Class 25, Use NT.

PART 3 - EXECUTION**3.1 SLEEVE INSTALLATION**

- A. Install PVC pipe sleeves and sleeve seal systems for pool water treatment room.
- B. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- C. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch (25-mm) annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- D. Install sleeves in concrete floors, and concrete walls as new slabs and walls are constructed.
 - 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
 - 2. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level.
 - 3. Using silicone sealant, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- E. Install sleeves for pipes passing through interior partitions.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - 2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
 - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.
- F. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials.

3.2 STACK-SLEEVE-FITTING INSTALLATION

- A. Install stack-sleeve fittings in new slabs as slabs are constructed.
 - 1. Install fittings that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
 - 2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
 - 3. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level.

4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using grout, seal the space around outside of stack-sleeve fittings.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Use grout or silicone sealant to seal the space around outside of sleeve-seal fittings.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.
- B. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 1. Exterior Concrete Walls above Grade:
 - a. Steel pipe sleeves or Sleeve-seal fittings.
 2. Exterior Concrete Walls below Grade:
 - a. Cast-iron pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
 3. Concrete Slabs-on-Grade:
 - a. Cast-iron pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
 4. Concrete Slabs above Grade:
 - a. Stack-sleeve fittings.

5. Interior Partitions:
 - a. Steel pipe sleeves/PVC pipe sleeves.

END OF SECTION

SECTION 22 05 18 - ESCUTCHEONS FOR PLUMBING PIPING**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.
 - 2. Floor plates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 PRODUCTS**2.1 ESCUTCHEONS**

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install escutcheons for piping penetrations of cabinets, walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for 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.

- C. Install floor plates for piping penetrations of equipment-room floors.

- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 1. Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

SECTION 22 05 19 - METERS AND GAGES FOR PLUMBING PIPING**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
1. Filled-system thermometers.
 2. Light-activated thermometers.
 3. Thermowells.
 4. Dial-type pressure gages.
 5. Gage attachments.

PART 2 PRODUCTS**2.1 LIQUID-IN-GLASS THERMOMETERS**

- A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
 - a. Terice, H. O. Co.
 3. Standard: ASME B40.200.
 4. Case: Cast aluminum; 6-inch nominal size.
 5. Case Form: Back angle unless otherwise indicated.
 6. Tube: Glass with magnifying lens and blue organic liquid.
 7. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C).
 8. Window: Glass or plastic.
 9. Stem: Aluminum or brass and of length to suit installation.

- a. Design for Thermowell Installation: Bare stem.
 - 10. Connector: 3/4 inch (19 mm), with ASME B1.1 screw threads.
 - 11. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.
- B. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
 - a. Flo Fab Inc.
 - b. Miljoco Corporation.
 - c. Palmer Wahl Instrumentation Group.
 - d. Trerice, H. O. Co.
 - e. Weiss Instruments, Inc.
 - 3. Standard: ASME B40.200.
 - 4. Case: Cast aluminum; 7-inch nominal size unless otherwise indicated.
 - 5. Case Form: Adjustable angle unless otherwise indicated.
 - 6. Tube: Glass with magnifying lens and blue organic liquid.
 - 7. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C).
 - 8. Window: Glass or plastic.
 - 9. Stem: Aluminum and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
 - 10. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
 - 11. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 THERMOWELLS

- A. Thermowells:
- 1. Standard: ASME B40.200.
 - 2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
 - 3. Material for Use with Copper Tubing: CNR or CUNI.
 - 4. Material for Use with Steel Piping: CRES CSA.

5. Type: Stepped shank unless straight or tapered shank is indicated.
 6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
 7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
 8. Bore: Diameter required to match thermometer bulb or stem.
 9. Insertion Length: Length required to match thermometer bulb or stem.
 10. Lagging Extension: Include on thermowells for insulated piping and tubing.
 11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.
- B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.3 PRESSURE GAGES

- A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
 - a. AMETEK, Inc.; U.S. Gauge.
 - b. Ashcroft Inc.
 - c. Ernst Flow Industries.
 - d. Flo Fab Inc.
 - e. Marsh Bellofram.
 - f. Miljoco Corporation.
 - g. Noshok.
 - h. Palmer Wahl Instrumentation Group.
 - i. REOTEMP Instrument Corporation.
 - j. Tel-Tru Manufacturing Company.
 - k. Trerice, H. O. Co.
 - l. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
 - m. Weiss Instruments, Inc.
 - n. WIKA Instrument Corporation - USA.
 - o. Winters Instruments - U.S.
 3. Standard: ASME B40.100.
 4. Case: Liquid-filled Sealed type(s); cast aluminum or drawn steel; 6-inch nominal diameter.
 5. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
 6. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
 7. Movement: Mechanical, with link to pressure element and connection to pointer.

8. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa).
9. Pointer: Dark-colored metal.
10. Window: Glass or plastic.
11. Ring: Metal.
12. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.
- G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- H. Install remote-mounted pressure gages on panel.
- I. Install valve and snubber in piping for each pressure gage for fluids.
- J. Install thermometers in the following locations:
 1. Inlet and outlet of each water heater.
 2. Inlet and outlet of domestic hot water thermostatic mixing valves.
- K. Install pressure gages in the following locations:
 1. Building water service entrance into building.
 2. Inlet and outlet of each pressure-reducing valve.
 3. Suction and discharge of each domestic circulating water pumps.

3.2 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Domestic Cold-Water Piping: 0 to 150 deg F (Minus 20 to plus 70 deg C).
- B. Scale Range for Domestic Hot-Water Piping: 30 to 240 deg F (0 to plus 115 deg C).

3.3 PRESSURE-GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Water Service Piping: 0 to 160 psi (0 to 1100 kPa).
- B. Scale Range for Domestic Water Piping: 0 to 100 psi (0 to 600 kPa).

3.4 CONNECTIONS

- A. Install thermometers and gages adjacent to machines and equipment to allow service and maintenance of thermometers, gages, machines, and equipment.

3.5 ADJUSTING

- A. Adjust faces of thermometers and gages to proper angle for best visibility.

END OF SECTION

SECTION 22 05 23.12 - BALL VALVES FOR PLUMBING PIPING**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Brass ball valves.
 - 2. Bronze ball valves.
 - 3. Iron ball valves.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, and soldered ends.
 - 3. Set ball valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

PART 2 PRODUCT**2.1 GENERAL REQUIREMENTS FOR VALVES**

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded end valves.
 - 2. ASME B16.1 for flanges on iron valves.
 - 3. ASME B16.18 for solder-joint connections.
 - 4. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
 - 1. Gear Actuator: For quarter-turn valves NPS 4 (DN 100) and larger.
 - 2. Handlever: For quarter-turn valves smaller than NPS 4 (DN 100).
- H. Valves in Insulated Piping:
 - 1. Include 2-inch (50-mm) stem extensions.
 - 2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
 - 3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRASS BALL VALVES

- A. Brass Ball Valves, Two-Piece with Regular Port and Stainless-Steel Trim:
 - 1. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 600 psig (4140 kPa).
 - c. Body Design: Two piece.
 - d. Body Material: Brass or bronze.
 - e. Ends: Threaded and soldered.

- f. Seats: PTFE.
- g. Stem: Stainless steel.
- h. Ball: Stainless steel, vented.
- i. Port: Regular.

2.3 BRONZE BALL VALVES

A. Bronze Ball Valves, Two-Piece with Regular Port and Stainless-Steel Trim:

- 1. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 600 psig (4140 kPa).
 - c. Body Design: Two piece.
 - d. Body Material: Bronze.
 - e. Ends: Threaded.
 - f. Seats: PTFE.
 - g. Stem: Stainless steel.
 - h. Ball: Stainless steel, vented.
 - i. Port: Regular.

2.4 IRON BALL VALVES

A. Iron Ball Valves, Class 125:

- 1. Description:
 - a. Standard: MSS SP-72.
 - b. CWP Rating: 200 psig (1380 kPa).
 - c. Body Design: Split body.
 - d. Body Material: ASTM A 126, gray iron.
 - e. Ends: Flanged or threaded.
 - f. Seats: PTFE.
 - g. Stem: Stainless steel.
 - h. Ball: Stainless steel.
 - i. Port: Full.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.

- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- B. Select valves with the following end connections:
 - 1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option or press-end option is indicated in valve schedules below.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 (DN 50) and Smaller:
 - 1. Bronze ball valves, two-piece with regular port and stainless-steel trim.
- B. Pipe NPS 2-1/2 (DN 65) and Larger:
 - 1. Iron ball valves, Class 150.

END OF SECTION

SECTION 22 05 23.13 - BUTTERFLY VALVES FOR PLUMBING PIPING**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Iron, single-flange butterfly valves.
 - 2. Chainwheels.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene-diene terpolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 Annex G and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set butterfly valves closed or slightly open.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B16.1 for flanges on iron valves.
 - 2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 3. ASME B31.9 for building service piping valves.
- C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.
- D. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
 - 1. Gear Actuator: For valves NPS 8 (DN 200) and larger.
 - 2. Handlever: For valves NPS 6 (DN 150) and smaller.
 - 3. Chainwheel: Device for attachment to gear, handlever, or stem; of size and with chain for mounting height, according to "Valve Installation" Article.
- H. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions.

2.2 IRON, SINGLE-FLANGE BUTTERFLY VALVES

- A. Iron, Single-Flange Butterfly Valves with Aluminum-Bronze Disc:
 - 1. Description:
 - a. Standard: MSS SP-67, Type I.
 - b. CWP Rating: 200 psig (1380 kPa).
 - 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/NBR.
 - f. Stem: One- or two-piece stainless steel.
 - g. Disc: Aluminum bronze.

- B. Iron, Single-Flange Butterfly Valves with Ductile-Iron Disc:
1. Description:
 - a. Standard: MSS SP-67, Type I.
 - b. CWP Rating: 200 psig (1380 kPa).
 - 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/NBR.
 - f. Stem: One- or two-piece stainless steel.
 - g. Disc: Nickel-plated ductile iron.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine mating flange faces for damage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- D. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install gate valve for the main domestic cold-water service shut-off valve. Do not use butterfly valve for the domestic cold-water service main shut-off valve.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem movement.
- F. Install chainwheels on operators for butterfly valves NPS 4 (DN 100) and larger and more than 96 inches (2400 mm) above floor. Extend chains to 60 inches (1520 mm) above finished floor.
- G. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2-1/2 (DN 65) and Larger:
 - 1. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM/NBR seat, aluminum-bronze/ductile-iron disc.
 - 2. Ductile-Iron, Grooved-End Butterfly Valves: 175CWP.

END OF SECTION

SECTION 22 05 23.14 - CHECK VALVES FOR PLUMBING PIPING**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Bronze lift check valves.
 - 2. Bronze swing check valves.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene-diene terpolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set check valves in either closed or open position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded end valves.
 - 2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 3. ASME B16.18 for solder joint.
 - 4. ASME B31.9 for building services piping valves.
- C. Drinking Water System Components - Health Effects and Drinking Water System Components - Lead Content Compliance: NSF 61 and NSF 372.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE LIFT CHECK VALVES

- A. Bronze Lift Check Valves with Bronze Disc, Class 125:
 - 1. Description:
 - a. Standard: MSS SP-80, Type 1.
 - b. CWP Rating: 200 psig (1380 kPa).
 - c. Body Design: Vertical flow.
 - d. Body Material: ASTM B 61 or ASTM B 62, bronze.
 - e. Ends: Threaded or soldered. See valve schedule articles.
 - f. Disc: Bronze.

2.3 BRONZE SWING CHECK VALVES

- A. Bronze Swing Check Valves with Bronze Disc, Class 125:
 - 1. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 200 psig (1380 kPa).
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded or soldered. See valve schedule articles.
 - f. Disc: Bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Check Valves: Install check valves for proper direction of flow.
 - 1. Swing Check Valves: In horizontal position with hinge pin level.

- F. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Pump-Discharge Check Valves:
 - a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with bronze disc.
- B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- C. End Connections:
 - 1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded or soldered ends.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 (DN 50) and Smaller:
 - 1. Bronze swing check valves with bronze disc, Class 125, with soldered or threaded end connections.

END OF SECTION

SECTION 22 05 23.15 - GATE VALVES FOR PLUMBING PIPING**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Bronze gate valves.
 - 2. Iron gate valves.
 - 3. Chainwheels.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. NRS: Nonrising stem.
- C. OS&Y: Outside screw and yoke.
- D. RS: Rising stem.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set gate valves closed to prevent rattling.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.

2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
1. ASME B1.20.1 for threads for threaded end valves.
 2. ASME B16.1 for flanges on iron valves.
 3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 4. ASME B16.18 for solder joint.
 5. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 and NSP 372 for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. RS Valves in Insulated Piping: With 2-inch (50-mm) stem extensions.
- H. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE GATE VALVES

- A. Bronze Gate Valves, NRS, Class 125:
1. Description:
 - a. Standard: MSS SP-80, Type 1.
 - b. CWP Rating: 200 psig (1380 kPa).
 - c. Body Material: Bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded or solder joint.
 - e. Stem: Bronze.
 - f. Disc: Solid wedge; bronze.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron, bronze, or aluminum.

2.3 IRON GATE VALVES

- A. Iron Gate Valves, NRS, Class 150:
 - 1. Description:
 - a. Standard: MSS SP-70, Type I.
 - b. CWP Rating: 200 psig (1380 kPa).
 - c. Body Material: Gray iron with bolted bonnet.
 - d. Ends: Flanged.
 - e. Trim: Bronze.
 - f. Disc: Solid wedge.
 - g. Packing and Gasket: Asbestos free.

- B. Iron Gate Valves, OS&Y, Class 250:
 - 1. Description:
 - a. Standard: MSS SP-70, Type I.
 - b. CWP Rating: 500 psig (3450 kPa).
 - c. Body Material: Gray iron with bolted bonnet.
 - d. Ends: Flanged.
 - e. Trim: Bronze.
 - f. Disc: Solid wedge.
 - g. Packing and Gasket: Asbestos free.

2.4 CHAINWHEELS

- A. Description: Valve actuation assembly with sprocket rim, chain guides, chain, and attachment brackets for mounting chainwheels directly to hand wheels.
 - 1. Sprocket Rim with Chain Guides: Ductile or cast iron, of type and size required for valve.
 - 2. Chain: Hot-dip galvanized steel, of size required to fit sprocket rim.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install a gate valve for the domestic service main valve.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem movement.
- F. Install chainwheels on operators for gate valves NPS 4 (DN 100) and larger and more than 96 inches (2400 mm) above floor. Extend chains to 60 inches (1520 mm) above finished floor.
- G. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. Use gate valves for shutoff service only.
- B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 (DN 50) and Smaller:
 - 1. Bronze gate valves, NRS, Class 125 with soldered/threaded ends.
 - 2. Bronze gate valves, press ends.
- B. Pipe NPS 2-1/2 (DN 65) and Larger- Domestic cold-water services: Iron gate valves, NRS, Class 125 with flanged ends.
- C. Pipe NPS 2-1/2 (DN 65) and Larger- Fire sprinkler water services: Iron gate valves, OS&Y, Class 250 with flanged ends.

3.6 FIRE SPRINKLER MAIN SERVICE WATER VALVE SCHEDULE

- A. Fire sprinkler water services: Iron gate valves, OS&Y, Class 250 with flanged ends.

END OF SECTION

SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
1. Metal pipe hangers and supports.
 2. Trapeze pipe hangers.
 3. Fiberglass pipe hangers.
 4. Metal framing systems.
 5. Fiberglass strut systems.
 6. Thermal hanger-shield inserts.
 7. Fastener systems.
 8. Pipe stands.
 9. Pipe-positioning systems.
 10. Equipment supports.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
1. Trapeze pipe hangers.
 2. Metal framing systems.
 3. Fiberglass strut systems.
 4. Pipe stands.
 5. Equipment supports.

- C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Include design calculations for designing trapeze hangers.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.
- B. Pipe Welding Qualifications: Qualify procedures and operators according to 2015 ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

2.2 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, hot-dip galvanized, or electro-galvanized.
 3. Nonmetallic Coatings: Plastic coated or epoxy powder coated.
 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. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe and Tube 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.

2.3 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 FIBERGLASS PIPE HANGERS

A. Clevis-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 1 steel pipe hanger, except hanger is made of fiberglass or fiberglass-reinforced resin.
2. Hanger Rods: Continuous-thread rod, washer, and nuts made of fiberglass or stainless steel.
3. Flammability: ASTM D 635, ASTM E 84, UL 94.

B. Strap-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 9 or Type 10 steel pipe hanger, except hanger is made of fiberglass-reinforced resin.
 - a. Flammability: ASTM D 635, ASTM E 84, UL 94.
2. Hanger Rod and Fittings: Continuous-thread rod, washer, and nuts made of stainless steel.

2.5 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Description: Shop- or field-fabricated pipe-support assembly, made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
2. Standard: Comply with MFMA-4, factory-fabricated components for field assembly.
3. Channels: Continuous slotted stainless-steel channel with inturred lips.

4. Channel Width: Selected for applicable load criteria.
5. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.6 FIBERGLASS STRUT SYSTEMS

- A. Description: Structural-grade, factory-formed, glass-fiber-resin channels and angles for supporting multiple parallel pipes.
 1. Standard: Comply with MFMA-4, factory-fabricated components for field assembly.
 2. Channels: Continuous slotted fiberglass-reinforced plastic channel with inturred lips.
 3. Channel Width: Selected for applicable load criteria.
 4. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
 5. Fitting and Accessory Materials: Same as those for channels and angles.
 6. Rated Strength: Selected to suit applicable load criteria.
 7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.7 THERMAL HANGER-SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) 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 (688-kPa)/ASTM C 552, Type II cellular glass with 100-psig (688-kPa) 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 (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.8 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

- B. Mechanical-Expansion Anchors: Insert-wedge-type 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. Indoor Applications: Zinc-coated steel.

2.9 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.10 PIPE-POSITIONING SYSTEMS

- A. Description: IAPMO PS 42 positioning system composed of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.11 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-carbon-steel shapes.

2.12 MATERIALS

- A. Aluminum: ASTM B 221 (ASTM B 221M).
- B. Carbon Steel: ASTM A 1011/A 1011M.
- C. Structural Steel: ASTM A 36/A 36M carbon-steel plates, shapes, and bars; black and galvanized.
- D. Stainless Steel: ASTM A 240/A 240M.
- E. Grout: ASTM C 1107/C 1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with requirements in Section "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.

- B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

3.2 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size, or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-58. Install hangers and attachments as required to properly support piping from building structure.
- D. Metal/Fiberglass Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- E. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.
- F. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete, after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- G. Pipe Stand Installation:
 - 1. Pipe Stand Types, except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
 - 2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.
- H. Pipe-Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- I. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- J. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

- K. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- L. Install lateral bracing with pipe hangers and supports to prevent swaying.
- M. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms, and install reinforcing bars through openings at top of inserts.
- N. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- O. 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.
- P. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating Below Ambient Air Temperature: Use thermal hanger-shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39 protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
 - 3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
 - b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
 - c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.

5. Thermal Hanger Shields: Install with insulation of same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment, and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections, so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

3.6 PAINTING

- A. Touchup: Clean field welds and abraded, shop-painted areas. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded, shop-painted areas on miscellaneous metal are specified in Sections "Exterior Painting.", "Interior Painting."
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A 780/A 780M.

3.7 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-58 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 finishes.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers, and metal framing systems, and attachments for general service applications.
- F. Use stainless-steel pipe hangers and fiberglass pipe hangers and fiberglass strut systems and stainless-steel attachments pool mechanical room applications.
- G. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal hanger-shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
 3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
 4. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
 5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 6. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 8. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 (DN 65 to DN 900) if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
 9. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction occurs.
 10. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 (DN 65 to DN 600), from single rod if horizontal movement caused by expansion and contraction occurs.
 11. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction occurs but vertical adjustment is unnecessary.
 12. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 (DN 50 to DN 600) if small horizontal movement caused by expansion and contraction occurs and vertical adjustment is unnecessary.
 13. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 (DN 50 to DN 750) if vertical and lateral adjustment during installation, in addition to expansion and contraction, is required.
- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.
- L. 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 of up to 6 inches (150 mm) for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11 split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

- M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable-Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb (340 kg).
 - b. Medium (MSS Type 32): 1500 lb (680 kg).
 - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- N. 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.
- O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
 2. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- P. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- R. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- S. Use pipe-positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Pipe labels.
 - 3. Stencils.
 - 4. Valve tags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch (0.8-mm) 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 (64 by 19 mm).
3. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
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 (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.3 STENCILS

- A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch (19 mm) for access panel and door labels, equipment labels, and similar operational instructions.
1. Stencil Material: Fiberboard or metal.
 2. Stencil Paint: Exterior, gloss, acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
 3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

2.4 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers.
1. Tag Material: Brass, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
 2. Fasteners: Brass wire-link or beaded chain; or S-hook.
- B. Valve Schedules: For domestic heater piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
1. Valve-tag schedule shall be included in operation and maintenance data.

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. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles on each piping system.

1. Identification Paint: Use for contrasting background.
 2. Stencil Paint: Use for pipe marking.
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
1. Near each valve and control device.
 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 5. Near major equipment items and other points of origination and termination.
 6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- C. Pipe Label Color Schedule:
1. Domestic Water Piping:
 - a. Background Color: White.
 - b. Letter Color: Black.
 2. Sanitary Waste and Storm Drainage Piping:
 - a. Background Color: White.
 - b. Letter Color: Black.
 3. HVAC Condensate Drainage Piping:
 - a. Background Color: White.
 - b. Letter Color: Black.

3.4 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, main shutoff valves in closet and main shut-off valves for the first and second floor restrooms. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
1. Valve-Tag Size and Shape:
 - a. Cold Water: 1-1/2 inches (38 mm), round.
 - b. Hot Water: 1-1/2 inches (38 mm), round.
 2. Valve-Tag Color:

- a. Cold Water: Natural.
 - b. Hot Water: Natural.
3. Letter Color:
- a. Cold Water: Black.
 - b. Hot Water: Black.

END OF SECTION

SECTION 22 05 93 - TESTING, ADJUSTING, AND BALANCING FOR PLUMBING**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Balancing Plumbing Piping Systems:
 - a. Constant-flow plumbing systems.
 - 2. Testing, Adjusting, and Balancing Equipment:
 - a. Domestic hot water heaters.
 - b. Domestic hot water re-circulation pumps.
 - c. Domestic hot water balancing valves.
 - 3. Vibration tests.
 - 4. Control system verification.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. BAS: Building automation systems.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. TABB: Testing, Adjusting, and Balancing Bureau.
- F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- G. TDH: Total dynamic head.

1.4 PREINSTALLATION MEETINGS

- A. TAB Conference: Conduct a TAB conference at the project site after approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Provide a minimum of 14 days' advance notice of scheduled meeting time and location.
 - 1. Minimum Agenda Items:
 - a. The Contract Documents examination report.
 - b. The TAB plan.
 - c. Needs for coordination and cooperation of trades and subcontractors.
 - d. Proposed procedures for documentation and communication flow.

1.5 ACTION SUBMITTALS

- A. Design Submittals:
 - 1. TAB Report: Documentation indicating that Work complies with ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
- C. 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.
- D. System Readiness Checklists: Within 30 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article.
- E. Examination Report: Submit a summary report of the examination review required in "Examination" Article.
- F. Certified TAB reports.
- G. Sample report forms.
- H. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.

3. Application.
4. Dates of use.
5. Dates of calibration.

1.7 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by AABC.
 1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.
 2. TAB Technician: Employee of the TAB specialist and certified by AABC as a TAB technician.
- B. TAB Specialists Qualifications: Certified by NEBB or TABB.
 1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB or TABB.
 2. TAB Technician: Employee of the TAB specialist and certified by NEBB or TABB as a TAB technician.
- C. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

1.8 FIELD CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.
- B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

- B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for Plumbing systems and equipment.
- D. Examine design data including Plumbing system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about Plumbing system and equipment controls.
- E. Examine equipment performance data including 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 Plumbing equipment when installed under conditions different from the conditions used to rate equipment performance.
- F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- G. Examine test reports specified in individual system and equipment Sections.
- H. Examine Plumbing equipment and verify that bearings are greased and equipment with functioning controls is ready for operation.
- I. Examine major equipment, such as electric air source heat pump water heaters, and verify that they are accessible and their controls are connected and functioning.
- J. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.
- K. Examine balancing valves for proper installation for their intended function of throttling fluid flows.
- L. Examine system pumps to ensure absence of entrained air in the suction piping.
- M. Examine operating safety interlocks and controls on Plumbing equipment.
- N. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes the following:
 - 1. Equipment and systems to be tested.

2. Strategies and step-by-step procedures for balancing the systems.
 3. Instrumentation to be used.
 4. Sample forms with specific identification for all equipment.
- B. Perform system-readiness checks of Plumbing systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
1. Water:
 - a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
 - b. Piping is complete with balancing valves installed.
 - c. Water treatment is complete.
 - d. Systems are flushed, filled, and air purged.
 - e. Strainers are pulled and cleaned.
 - f. Control valves are functioning per the sequence of operation.
 - g. Shutoff and balance valves have been verified to be 100 percent open.
 - h. Pumps are started and proper rotation is verified.
 - i. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
 - j. Suitable access to balancing devices and equipment is provided.

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.
- B. Cut insulation, pipes, and equipment for installation of test probes to the minimum extent necessary for TAB procedures.
 1. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 22 07 19 "Plumbing Piping Insulation."
- C. Mark equipment and balancing devices, including valve position indicators, 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) and metric (SI) units.

3.4 GENERAL PROCEDURES FOR DOMESTIC HOT WATER RE-CIRCULATION SYSTEMS

- A. Prepare test reports for pumps, balancing valves, and electric air source heat pump water heaters. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required balancing valve flow rates with pump design flow rate.
- B. Prepare schematic diagrams of systems' "as-built" piping layouts.
- C. In addition to requirements in "Preparation" Article, prepare domestic hot water re-circulation systems for testing and balancing as follows:
 - 1. Check liquid level in expansion tank.
 - 2. Check check valves for proper position.
 - 3. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
 - 4. Verify that motor starters are equipped with properly sized thermal protection.
 - 5. Check that air has been purged from the system.

3.5 PROCEDURES FOR CONSTANT-FLOW DOMESTIC HOT WATER RE-CIRCULATION SYSTEMS

- A. Adjust pumps to deliver total design flow.
 - 1. Measure total water flow.
 - a. Measure flow by main flow meter, if installed.
 - b. If main flow meter is not installed, determine flow by pump TDH.
 - 2. Measure pump TDH as follows:
 - a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - c. Convert pressure to head and correct for differences in gage heights.
 - d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
 - e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.

3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
- B. Adjust flow-measuring devices installed in mains and branches to design water flows.
1. Measure flow in main and branch pipes.
 2. Adjust main and branch balance valves for design flow.
 3. Re-measure each main and branch after all have been adjusted.
- C. Adjust flow-measuring devices installed at terminals for each space to design water flows.
1. Measure flow at each balancing valve.
 2. Adjust each balancing valve to design flow.
 3. Re-measure each balancing valve after it is adjusted.
 4. Perform temperature tests after flows have been balanced.
- D. For systems with pressure-independent balancing valves:
1. Measure differential pressure and verify that it is within manufacturer's specified range.
 2. Perform temperature tests after flows have been verified.
- E. For systems without pressure-independent balancing valves:
1. Measure and balance balancing valves by pressure drop method.
- F. Verify final system conditions as follows:
1. Re-measure and confirm that total water flow is within design.
 2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 3. Mark final settings.
- G. Verify that memory stops have been set.

3.6 PROCEDURES FOR MOTORS

- A. Motors: 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. Phase and hertz.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter size and thermal-protection-element rating.
8. Service factor and frame size.

3.8 SOUND TESTS

3.9 VIBRATION TESTS

- A. After systems are balanced and construction is Substantially Complete, measure and record vibration levels on equipment having motor horsepower equal to or greater than 10.
- B. Instrumentation:
 1. Use portable, battery-operated, and microprocessor-controlled vibration meter with or without a built-in printer.
 2. The meter shall automatically identify engineering units, filter bandwidth, amplitude, and frequency scale values.
 3. The meter shall be able to measure machine vibration displacement in mils of deflection, velocity in inches per second, and acceleration in inches per second squared.
 4. Verify calibration date is current for vibration meter before taking readings.
- C. Test Procedures:
 1. To ensure accurate readings, verify that accelerometer has a clean, flat surface and is mounted properly.
 2. With the unit running, set up vibration meter in a safe, secure location. Connect transducer to meter with proper cables. Hold magnetic tip of transducer on top of the bearing, and measure unit in mils of deflection. Record measurement, then move transducer to the side of the bearing and record in mils of deflection. Record an axial reading in mils of deflection by holding nonmagnetic, pointed transducer tip on end of shaft.
 3. Change vibration meter to velocity (inches per second) measurements. Repeat and record above measurements.
 4. Record CPM or rpm.

5. Read each bearing on motor, fan, and pump as required. Track and record vibration levels from rotating component through casing to base.

D. Reporting:

1. Report shall record location and the system tested.
2. Include horizontal-vertical-axial measurements for tests.
3. Verify that vibration limits follow Specifications, or, if not specified, follow the General Machinery Vibration Severity Chart or Vibration Acceleration General Severity Chart from the AABC National Standards. Acceptable levels of vibration are normally "smooth" to "good."
4. Include in report General Machinery Vibration Severity Chart, with conditions plotted.

3.10 CONTROLS VERIFICATION

A. In conjunction with system balancing, perform the following:

1. Verify temperature control system is operating within the design limitations.
2. Confirm that the sequences of operation are in compliance with Contract Documents.
3. Verify that controllers are calibrated and function as intended.
4. Verify that controller set points are as indicated.
5. Verify the operation of lockout or interlock systems.
6. Verify the operation of valve and damper actuators.
7. Verify that controlled devices are properly installed and connected to correct controller.
8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
9. Verify location and installation of sensors to ensure that they sense only intended temperature or pressure.

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

3.11 TOLERANCES

A. Set Plumbing system's water flow rates within the following tolerances:

1. Domestic Hot Water Re-circulation Flow Rate: Plus or minus 10 percent.
 2. Domestic Hot Water Heater: Plus or minus 10 percent.
 3. Domestic Hot Water Balancing Valve Flow Rate: Plus or minus 10 percent.
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.12 PROGRESS 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 Plumbing 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.

3.13 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 2. Include a list of instruments used for procedures, along with proof of calibration.
 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
1. Pump curves.
 2. Manufacturers' test data.
 3. Field test reports prepared by system and equipment installers.
 4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.
- C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
 2. Name and address of the TAB specialist.
 3. Project name.
 4. Project location.
 5. Architect's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB supervisor who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 15. Test conditions for pump performance forms including the following:
 - a. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of domestic hot water re-circulation distribution systems. Present each system with single-line diagram and include the following:
1. Water flow rates.
 2. Pipe and valve sizes and locations.
 3. Position of balancing devices.

E. Electric air source heat pump water heaters: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Electric capacity in Btu/h (kW).
 - g. Motor horsepower and rpm.
 - h. Motor volts, phase, and hertz.
 - i. Motor full-load amperage and service factor.

F. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Service.
 - d. Make and size.
 - e. Model number and serial number.
 - f. Water flow rate in gpm (L/s).
 - g. Water pressure differential in feet of head or psig (kPa).
 - h. Required net positive suction head in feet of head or psig (kPa).
 - i. Pump rpm.
 - j. Impeller diameter in inches (mm).
 - k. Motor make and frame size.

- l. Motor horsepower and rpm.
 - m. Voltage at each connection.
 - n. Amperage for each phase.
 - o. Full-load amperage and service factor.
 - p. Seal type.
2. Test Data (Indicated and Actual Values):
- a. Static head in feet of head or psig (kPa).
 - b. Pump shutoff pressure in feet of head or psig (kPa).
 - c. Actual impeller size in inches (mm).
 - d. Full-open flow rate in gpm (L/s).
 - e. Full-open pressure in feet of head or psig (kPa).
 - f. Final discharge pressure in feet of head or psig (kPa).
 - g. Final suction pressure in feet of head or psig (kPa).
 - h. Final total pressure in feet of head or psig (kPa).
 - i. Final water flow rate in gpm (L/s).
 - j. Voltage at each connection.
 - k. Amperage for each phase.
- G. Instrument Calibration Reports:
1. Report Data:
- a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.14 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of the Architect, Owner, Construction Manager, Engineer and Commissioning Authority.
- B. Architect, Owner, Construction Manager, Engineer and Commissioning Authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- E. If TAB work fails, proceed as follows:
 - 1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
 - 2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
 - 3. If the second verification also fails, the Owner, Engineer and / or Architect may contact AABC Headquarters regarding the AABC National Performance Guaranty.
- F. Prepare test and inspection reports.

3.15 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.

END OF SECTION

SECTION 22 07 19 - PLUMBING PIPING INSULATION**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic cold-water piping.
 - 2. Domestic hot-water piping.
 - 3. Domestic recirculating hot-water piping.
 - 4. Supplies and drains for handicap-accessible lavatories and sinks.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail insulation application at pipe expansion joints for each type of insulation.
 - 3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 4. Detail removable insulation at piping specialties, equipment connections, and access panels.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.
1. Piping Mockups:
 - a. One 10-foot (3-m) section of NPS 2 (DN 50) straight pipe.
 - b. One each of a 90-degree threaded, welded, and flanged elbow.
 - c. One each of a threaded, welded, and flanged tee fitting.
 - d. One NPS 2 (DN 50) or smaller valve, and one NPS 2-1/2 (DN 65) or larger valve.
 - e. Four support hangers including hanger shield and insert.
 - f. One threaded strainer and one flanged strainer with removable portion of insulation.
 - g. One threaded reducer and one welded reducer.
 - h. One pressure temperature tap.
 - i. One mechanical coupling.
 2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 4. Obtain Architect's approval of mockups before starting insulation application.
 5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 7. Demolish and remove mockups when directed.
- D. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

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

PART 2 PRODUCTS**2.1 INSULATION MATERIALS**

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor 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. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
- G. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Type I, 850 Deg F (454 Deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- D. PVC Jacket Adhesive: Compatible with PVC jacket.

2.4 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.
 - 1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
 - 3. Service Temperature Range: 0 to plus 180 deg F (Minus 18 to plus 82 deg C).
 - 4. Color: White.

2.5 SEALANTS

- A. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
 - 4. Color: White.

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2.7 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Width: 3 inches (75 mm).
 2. Thickness: 11.5 mils (0.29 mm).
 3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Width: 2 inches (50 mm).
 2. Thickness: 6 mils (0.15 mm).
 3. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
 4. Elongation: 500 percent.
 5. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.

2.8 SECUREMENTS

- A. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

2.9 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers:
1. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.
- B. Protective Shielding Piping Enclosures:
1. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. 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. 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.
- 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.
- O. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- C. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular

- surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
 1. Install pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
 1. Install mitered sections of pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Install insulation to flanges as specified for flange insulation application.
 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 FINISHES

A. Insulation with ASJ, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in 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. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.8 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Underground piping.

2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.9 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. NPS 1-1/4 and Smaller: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1/2 inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
2. NPS 1-1/2 and Larger: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1 inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Domestic Hot and Recirculated Hot Water:

1. NPS 1-1/4 and Smaller: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1 inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
2. NPS 1-1/2 and Larger: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1-1/2 inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.

C. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities- insulation is not required if the exposed piping for ADA lavatories is covered by protected board by the general contractor:

1. All Pipe Sizes: Insulation shall be the following:
 - a. Flexible Elastomeric: 3/4 inch thick.

3.10 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Piping, Concealed & Exposed:

1. None for elastomeric pipe insulation
2. All Service Jacket for fiberglass pipe insulation.

END OF SECTION

SECTION 22 11 16 - DOMESTIC WATER PIPING**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Copper tube and fittings.
 - 2. Ductile-iron pipe and fittings.
 - 3. Galvanized steel pipe and fittings.
 - 4. Transition fittings.
 - 5. Dielectric fittings.

1.3 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

1.4 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

PART 2 PRODUCTS**2.1 PIPING MATERIALS**

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Include marking "NSF-pw" on piping.

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn temper.

- B. Soft Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A) water tube, annealed temper.
- C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- F. Copper Unions:
 - 1. MSS SP-123.
 - 2. Cast-copper-alloy, hexagonal-stock body.
 - 3. Ball-and-socket, metal-to-metal seating surfaces.
 - 4. Solder-joint or threaded ends.
- G. Copper, Brass, or Bronze Pressure-Seal-Joint Fittings:
 - 1. Fittings: Cast-brass, cast-bronze or wrought-copper with EPDM O-ring seal in each end. Sizes NPS 2-1/2 (DN 65) and larger with stainless steel grip ring and EPDM O-ring seal.
 - 2. Minimum 200-psig (1379-kPa) working-pressure rating at 250 deg F (121 deg C).
- H. Appurtenances for Grooved-End Copper Tubing:
 - 1. Bronze Fittings for Grooved-End, Copper Tubing: ASTM B 75/B 75M copper tube or ASTM B 584 bronze castings.
 - 2. Mechanical Couplings for Grooved-End Copper Tubing:
 - a. Copper-tube dimensions and design similar to AWWA C606.
 - b. Ferrous housing sections.
 - c. EPDM-rubber gaskets suitable for hot and cold water.
 - d. Bolts and nuts.
 - e. Minimum Pressure Rating: 300 psig (2070 kPa).

2.3 DUCTILE-IRON PIPE AND FITTINGS

- A. Mechanical-Joint, Ductile-Iron Pipe:
 - 1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
 - 2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- B. Standard-Pattern, Mechanical-Joint Fittings:

1. AWWA C110/A21.10, ductile or gray iron.
 2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- C. Push-on-Joint, Ductile-Iron Pipe:
1. AWWA C151/A21.51.
 2. Push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
- D. Standard-Pattern, Push-on-Joint Fittings:
1. AWWA C110/A21.10, ductile or gray iron.
 2. Gaskets: AWWA C111/A21.11, rubber.
- E. Plain-End, Ductile-Iron Pipe: AWWA C151/A21.51.
- F. Appurtenances for Grooved-End, Ductile-Iron Pipe:
1. Fittings for Grooved-End, Ductile-Iron Pipe: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions that match pipe.
 2. Mechanical Couplings for Grooved-End, Ductile-Iron-Piping:
 - a. AWWA C606 for ductile-iron-pipe dimensions.
 - b. Ferrous housing sections.
 - c. EPDM-rubber gaskets suitable for hot and cold water.
 - d. Bolts and nuts.

2.4 GALVANIZED-STEEL PIPE AND FITTINGS

- A. Galvanized-Steel Pipe:
1. ASTM A 53/A 53M, Type E, Standard Weight.
 2. Include ends matching joining method.
- B. Flanges: ASME B16.1, Class 125, cast iron.
- C. Appurtenances for Grooved-End, Galvanized-Steel Pipe:
1. Fittings for Grooved-End, Galvanized-Steel Pipe: Galvanized, ASTM A 47/A 47M, malleable-iron casting; ASTM A 106/A 106M, steel pipe; or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
 2. Fittings for Grooved-End, Galvanized-Steel Pipe:
 - a. AWWA C606 for steel-pipe dimensions.

- b. Ferrous housing sections.
- c. EPDM-rubber gaskets suitable for hot and cold water.
- d. Bolts and nuts.
- e. Minimum Pressure Rating:
 - 1) NPS 8 (DN 200) and Smaller: 600 psig (4137 kPa).

2.5 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
 - 1. AWWA C110/A21.10, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
 - 2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Flux: ASTM B 813, water flushable.

2.6 TRANSITION FITTINGS

- A. General Requirements:
 - 1. Same size as pipes to be joined.
 - 2. Pressure rating at least equal to pipes to be joined.
 - 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Sleeve-Type Transition Coupling: AWWA C219.

2.7 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 - 1. Standard: ASSE 1079.
 - 2. Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C).
 - 3. End Connections: Solder-joint copper alloy and threaded ferrous.

- C. Dielectric-Flange Insulating Kits:
 1. Nonconducting materials for field assembly of companion flanges.
 2. Pressure Rating: 150 psig (1035 kPa).
 3. Gasket: Neoprene or phenolic.
 4. Bolt Sleeves: Phenolic or polyethylene.
 5. Washers: Phenolic with steel backing washers.
- D. Dielectric Nipples:
 1. Standard: IAPMO PS 66.
 2. Electroplated steel nipple complying with ASTM F 1545.
 3. Pressure Rating and Temperature: 300 psig (2070 kPa) at 225 deg F (107 deg C).
 4. End Connections: Male threaded or grooved.
 5. Lining: Inert and noncorrosive, propylene.

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 underground copper tube and ductile-iron pipe in PE encasement according to ASTM A 674 or AWWA C105/A21.5.
- E. 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 in Section 221119 "Domestic Water Piping Specialties."
- F. Install shutoff valve immediately upstream of each dielectric fitting.

- G. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."
- H. Install domestic water piping level without pitch and plumb.
- I. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- J. 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.
- K. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- L. Install piping to permit valve servicing.
- M. 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.
- N. Install piping free of sags and bends.
- O. Install fittings for changes in direction and branch connections.
- P. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- Q. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."
- R. Install thermostats in hot-water circulation piping.
- S. 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."
- T. 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."
- U. 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."
- V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Braze Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools and procedure recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly.
- G. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
- H. Joint Construction for Grooved-End, Ductile-Iron Piping: Make joints according to AWWA C606. Cut round-bottom grooves in ends of pipe at gasket-seat dimension required for specified (flexible or rigid) joint. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.
- I. 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.
- J. 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.
- K. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
 - 1. Fittings for NPS 1-1/2 (DN 40) and Smaller: Fitting-type coupling.
 - 2. Fittings for NPS 2 (DN 50) and Larger: Sleeve-type coupling.
- C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 (DN 50) and Smaller: Plastic-to-metal transition fittings.

3.5 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric couplings or nipples.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flange kits.

3.6 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 (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- 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 (10 mm).
- D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
 - 2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
 - 3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
 - 4. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
 - 5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.
- E. Install supports for vertical copper tubing every 10 feet (3 m).
- F. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4 (DN 32) and Smaller: 84 inches (2100 mm) with 3/8-inch (10-mm) rod.

2. NPS 1-1/2 (DN 40): 108 inches (2700 mm) with 3/8-inch (10-mm) rod.
 3. NPS 2 (DN 50): 10 feet (3 m) with 3/8-inch (10-mm) rod.
 4. NPS 2-1/2 (DN 65): 11 feet (3.4 m) with 1/2-inch (13-mm) rod.
 5. NPS 3 and NPS 3-1/2 (DN 80 and DN 90): 12 feet (3.7 m) with 1/2-inch (13-mm) rod.
 6. NPS 4 and NPS 5 (DN 100 and DN 125): 12 feet (3.7 m) with 5/8-inch (16-mm) rod.
- G. Install supports for vertical steel piping every 15 feet (4.5 m).
- H. Support piping and tubing not listed in this article according to MSS SP-58 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
1. 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. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.8 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
1. Piping Inspections:

- a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
 - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
2. Piping Tests:
- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
 - c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - d. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
 - f. Prepare reports for tests and for corrective action required.
- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
 - C. Prepare test and inspection reports.

3.10 ADJUSTING

- A. Perform the following adjustments before operation:
 - 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open shutoff valves to fully open position.

3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Clean non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.

2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Under-building-slab, domestic water, and fire-service main, building-service piping shall be one of the following:
 1. Soft copper tube, ASTM B 88, Type K (ASTM B 88M, Type A); wrought-copper, solder-joint fittings; and brazed joints.
 2. Mechanical-joint, ductile-iron pipe; standard-pattern, mechanical-joint fittings; and mechanical joints.
 3. Push-on-joint, ductile-iron pipe; standard-pattern, push-on-joint fittings; and gasketed joints.
- D. Aboveground, interior, domestic water piping for main water services, all domestic cold-water, hot-water, and hot-water re-circulating piping within mechanical room and interior exposed piping shall be the following:
 1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); wrought-copper, solder-joint fittings; and soldered joints.
 2. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); copper pressure-seal-joint fittings; and pressure-sealed joints.
- E. Aboveground, interior, concealed domestic water piping for all cold-water, hot-water, and hot-water re-circulating piping throughout the building shall be the following:
 1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); wrought-copper, solder-joint fittings; and soldered joints.
 2. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); copper pressure-seal-joint fittings; and pressure-sealed joints.
- F. Aboveground fire water service piping up to backflow preventer assembly shall be the following:
 1. Galvanized-steel pipe; grooved-joint, galvanized-steel-pipe appurtenances; and grooved joints.

3.13 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
1. Shutoff Duty: Use ball or gate valves for piping NPS 2 (DN 50) and smaller. Use butterfly, or gate valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
 2. Throttling Duty: Use ball valves for piping NPS 2 (DN 50) and smaller. Use butterfly valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
 3. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
 4. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION

SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Vacuum breakers.
 - 2. Backflow preventers.
 - 3. Water pressure-reducing valves.
 - 4. Balancing valves.
 - 5. Temperature-actuated, water mixing valves.
 - 6. Strainers.
 - 7. Hose bibbs.
 - 8. Wall hydrants.
 - 9. Water-hammer arresters.
 - 10. Air vents.
- B. Related Requirements:
 - 1. Section 220519 "Meters and Gauges for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
 - 2. Section 221116 "Domestic Water Piping" for water meters.
 - 3. Section 224716 "Pressure Water Coolers" for water filters for water coolers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For domestic water piping specialties.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 PRODUCTS**2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES**

- A. Potable-water piping and components shall comply with NSF 61 and NSF 14.
- B. Comply with NSF 372 for low lead.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 (860) psig (kPa) unless otherwise indicated.

2.3 VACUUM BREAKERS

- A. Hose-Connection Vacuum Breakers- Service sink:
 - 1. Standard: ASSE 1011.
 - 2. Body: Bronze, nonremovable, with manual drain.
 - 3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
 - 4. Finish: Chrome or nickel plated/Rough bronze.
- B. Pressure Vacuum Breakers- Swimming pool make-up water line:
 - 1. Standard: ASSE 1020.
 - 2. Operation: Continuous-pressure applications.
 - 3. Pressure Loss: 5 (35) psig (kPa) maximum, through middle third of flow range.
 - 4. Design Flow Rate: 100 gpm.
 - 5. Size: 2"
 - 6. Selected Unit Flow Range Limits: 120 gpm.
 - 7. Pressure Loss at Design Flow Rate: 5 psig.

8. Accessories:
 - a. Valves: Ball type, on inlet and outlet.

2.4 BACKFLOW PREVENTERS

- A. Reduced-Pressure-Principle Backflow Preventers- Domestic Cold-water main services, Make-up water for Heating hot water and Chilled water distribution systems:
 1. Standard: ASSE 1013.
 2. Operation: Continuous-pressure applications.
 3. Pressure Loss: 7 psig maximum, through middle third of flow range.
 4. Size: See drawing.
 5. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved/steel with interior lining that complies with AWWA C550 or that is FDA approved/stainless steel for NPS 2-1/2 (DN 65) and larger.
 6. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
 7. Configuration: Designed for horizontal, straight-through flow for make-up water systems> Vertical-inlet, horizontal-center-section, and vertical-outlet flow for cold-water main service flow.
 8. Accessories:
 - a. Valves NPS 2 (DN 50) and Smaller: Ball type with threaded ends on inlet and outlet.
 - b. Valves NPS 2-1/2 (DN 65) and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
 - c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.
- B. Backflow-Preventer Test Kits:
 1. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.5 WATER PRESSURE-REDUCING VALVES

- A. Water Regulators:
 1. Standard: ASSE 1003.
 2. Pressure Rating: Initial working pressure of 150 psig (1035 kPa).
 3. Size: Same size of make-up water service pipe as shown on floor plan.
 4. Design Inlet Pressure: 65 psig.

5. Design Outlet Pressure Setting: As shown on floor plan.
6. Body: Bronze with chrome-plated finish]for NPS 2 (DN 50) 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 (DN 65 and DN 80).
7. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).

2.6 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Type: Ball or Y-pattern globe valve with two readout ports and memory-setting indicator.
2. Body: Brass or bronze.
3. Size: Same as connected piping.
4. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

2.7 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Thermostatic, Water Mixing-Valve Assemblies:

1. Description: Factory-fabricated, exposed-mounted, thermostatically controlled, water mixing-valve assembly in two-valve parallel arrangement.
2. Large-Flow Parallel: Thermostatic, water mixing valve and downstream-pressure regulator with pressure gages on inlet and outlet.
3. Small-Flow Parallel: Thermostatic, water mixing valve.
4. Thermostatic Mixing Valves: Comply with ASSE 1017. Include check stops on hot- and cold-water inlets and shutoff valve on outlet.
5. Water Regulators: Comply with ASSE 1003. Include pressure gage on inlet and outlet.
6. Pressure Rating: 125 psig (860 kPa) minimum unless otherwise indicated.
7. Selected Large-Flow, Tempered-Water Valve Size: As shown on drawing schedule.
8. Tempered-Water Setting: 120 deg F (deg C), adjustable.
9. Unit Tempered-Water Design Flow Rate: As shown on drawing schedule.
10. Unit Minimum Tempered-Water Design Flow Rate: As shown on drawing schedule.
11. Thermostatic Mixing Valve and Water Regulator Finish: Polished, chrome plated/Rough bronze.
12. Piping Finish: Chrome plated/Copper.

- B. Individual-Fixture, Water Tempering Valves- Lavatory, Kitchen Sink, and Emergency eyewash:
1. Standard: ASSE 1016, thermostatically controlled, water tempering valve.
 2. Pressure Rating: 125 psig (860 kPa) minimum unless otherwise indicated.
 3. Body: Bronze body with corrosion-resistant interior components.
 4. Temperature Control: Adjustable.
 5. Inlets and Outlet: Threaded.
 6. Finish: Rough or chrome-plated bronze.
 7. Tempered-Water Setting: 95 deg F for Lavatory and sink, 70 deg F for Emergency eye wash.
 8. Tempered-Water Design Flow Rate: As shown on drawings.

2.8 STRAINERS FOR DOMESTIC WATER PIPING

- A. Y-Pattern Strainers at upstream of Backflow Preventer Assembly:
1. Pressure Rating: 125 psig (860 kPa) minimum unless otherwise indicated.
 2. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 (DN 65) and larger.
 3. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
 4. Screen: Stainless steel with round perforations unless otherwise indicated.
 5. Perforation Size:
 - a. Strainers NPS 2 (DN 50) and Smaller: 0.020 (0.51) inch (mm).
 - b. Strainers NPS 2-1/2 to NPS 4 (DN 65 to DN 100): 0.045 (1.14) inch (mm).
 - c. Strainers NPS 5 (DN 125) and Larger: 0.125 (3.18) inch (mm).
 6. Drain: Factory-installed, hose-end drain valve.

2.9 HOSE BIBBS

- A. Hose Bibbs:
1. Standard: ASME A112.18.1 for sediment faucets.
 2. Body Material: Bronze.
 3. Seat: Bronze, replaceable.

4. Supply Connections: NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig (860 kPa).
7. Vacuum Breaker: Integral, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Finished Rooms: Chrome or nickel plated.
10. Operation for Equipment Rooms: Wheel handle.
11. Operation for Finished Rooms: Operating key.
12. Include operating key with each operating-key hose bibb.
13. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.10 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:

1. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
2. Pressure Rating: 125 psig (860 kPa).
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 (DN 20 or DN 25).
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. Operating Keys(s): One with each wall hydrant.

2.11 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.

2. Pressure Rating: 400-psig (2760-kPa) minimum CWP.
3. Size: NPS 3/4 (DN 20).
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.12 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Standard: ASSE 1010 or PDI-WH 201.
2. Type: Metal bellows.
3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.13 AIR VENTS

A. Bolted-Construction Automatic Air Vents:

1. Body: Bronze.
2. Pressure Rating and Temperature: 125-psig (860-kPa) minimum pressure rating at 140 deg F (60 deg C).
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 (DN 10) minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

2.14 TRAP-SEAL GUARDS

A. Waterless Trap Seal Device- For each floor drain:

1. Flexible silicone sealing trap seal insert to keep sewer gases and odors.
2. Trap seal devices to match with the floor drains.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. **Backflow Preventers:** 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. **Water Regulators:** Install with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.
- C. **Balancing Valves:** Install in locations where they can easily be adjusted.
- D. **Temperature-Actuated, Water Mixing Valves:** Install with check stops or shutoff valves on inlets and with shutoff valve on outlet.
 - 1. Install cabinet-type units recessed in or surface mounted on wall as specified.
- E. **Y-Pattern Strainers:** For water, install on supply side of each water pressure-reducing valve and pump.
- F. **Water-Hammer Arresters:** Install in water piping according to PDI-WH 201.
- G. **Air Vents:** Install vents at high points of water piping.
- H. **Trap Seal Guards:** Install in each floor drain in accordance with the manufacturer's instructions.

3.2 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

3.3 IDENTIFICATION

- A. **Plastic Labels for Equipment:** Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 - 1. Pressure vacuum breakers.
 - 2. Reduced-pressure-principle backflow preventers.

3. Double-check, backflow-prevention assemblies.
 4. Water pressure-reducing valves.
 5. Calibrated balancing valves.
 6. Thermostatic, water mixing-valve assemblies.
 7. Water tempering valves.
- 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.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
1. Test each pressure vacuum breaker, reduced-pressure-principle backflow preventer, and double-check, backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION

SECTION 22 11 23.21 - INLINE, DOMESTIC-WATER PUMPS**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. In-line, sealless centrifugal pumps.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction materials, rated capacities, certified performance curves with operating points plotted on curves, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Detail pumps and adjacent equipment. Show support locations, type of support, weight on each support, required clearances, and other details, drawn to scale, on which the following items are shown.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For inline, domestic-water pumps to include in operation and maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.
- B. Protect bearings and couplings against damage.
- C. Comply with pump manufacturer's written instructions for handling.

PART 2 PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. UL Compliance: UL 778 for motor-operated water pumps.
- C. Drinking Water System Components - Health Effects and Drinking Water System Components - Lead Content Compliance: NSF 61 and NSF 372.

2.2 IN-LINE, SEALLESS CENTRIFUGAL PUMPS

- A. Description: Factory-assembled and -tested, in-line, close-coupled, canned-motor, sealless, overhung-impeller centrifugal pumps.
- B. Capacities and Characteristics: As shown on the equipment schedule on drawing.
- C. Pump Construction:
 - 1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge type with motor and impeller on common shaft and designed for installation with pump and motor shaft horizontal.
 - 2. Minimum Working Pressure: 125 psig (860 kPa).
 - 3. Maximum Continuous Operating Temperature: 220 deg F (104 deg C).
 - 4. Casing: Bronze, with threaded or companion-flange connections.
 - 5. Impeller: Bronze.
 - 6. Motor: Single speed.

2.3 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.4 CONTROLS

- A. Thermostats: Electric; adjustable for control of hot-water circulation pump.
 - 1. Type: Water-immersion temperature sensor, for installation in piping.
 - 2. Range: 50 to 125 deg F (10 to 52 deg C).

3. Enclosure: NEMA 250, Type 4X.
4. Operation of Pump: Enable and disable by the time clock.
5. Transformer: Provide if required.
6. Power Requirement: 120 V ac.
7. Settings: Start pump at 110 deg F (43 deg C) and stop pump at 120 deg F (49 deg C).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for domestic-water-piping system to verify actual locations of piping connections before pump installation.

3.2 PUMP INSTALLATION

- A. Comply with HI 1.4.
- B. Mount pumps in orientation complying with manufacturer's written instructions.
- C. Install continuous-thread hanger rods required to support pump weight.
 1. Comply with requirements for hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- D. Install thermostats in hot-water return piping.

3.3 PIPING CONNECTIONS

- A. Comply with requirements for piping specified in Section 22 11 16 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to inline, domestic-water pumps, allow space for service and maintenance.
- C. Connect domestic-water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.
- D. Install shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves same size as connected piping. Comply with requirements for strainers specified in Section 22 11 19 "Domestic Water Piping Specialties." Comply with requirements for valves specified in the following:
 1. Section 220523.12 "Ball Valves for Plumbing Piping."
 2. Section 22 052 3.14 "Check Valves for Plumbing Piping."

3. Install pressure gauge and snubber at suction of each pump and pressure gauge and snubber at discharge of each pump. Install at integral pressure-gauge tapings where provided or install pressure-gauge connectors in suction and discharge piping around pumps. Comply with requirements for pressure gauges and snubbers specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."

3.4 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring between temperature controllers and devices.
- C. Provide a relay and time clock control wiring to enable or disable the thermostatic controls based on the occupied and un-occupied mode time schedule.

3.5 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for identification of pumps.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Inline, domestic-water pump will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.7 STARTUP SERVICE

- A. Perform startup service.
 1. Complete installation and startup checks according to manufacturer's written instructions.
 2. Check piping connections for tightness.
 3. Clean strainers on suction piping.

4. Set thermostats for automatic starting and stopping operation of pumps.
5. Perform the following startup checks for each pump before starting:
 - a. Verify bearing lubrication.
 - b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
 - c. Verify that pump is rotating in the correct direction.
6. Start motor.
7. Open discharge valve slowly.
8. Adjust temperature settings on thermostats.
9. Adjust time clock and time schedule settings.

3.8 ADJUSTING

- A. Adjust inline, domestic-water pumps to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust initial temperature set points.

END OF SECTION

SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. PVC pipe and fittings.
 - 2. Specialty pipe fittings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).

2.2 PIPING MATERIALS

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 PVC PIPE AND FITTINGS

- A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

- B. Solid-Wall Sch 40 PVC Pipe: ASTM D 2665, drain, waste, and vent.
- C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- D. Adhesive Primer: ASTM F 656.
- E. Solvent Cement: ASTM D 2564.

2.4 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
 - 1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
 - 2. Unshielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1173.
 - b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. End Connections: Same size as and compatible with pipes to be joined.
 - d. Sleeve Materials:
 - 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.
 - 3. Shielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1460.
 - b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. End Connections: Same size as and compatible with pipes to be joined.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in elsewhere in the specifications.

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
 - 1. 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. Install piping to allow application of insulation.
- I. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
 - 1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
 - 2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
 - a. Straight tees, elbows, and crosses may be used on vent lines.
 - 3. Do not change direction of flow more than 90 degrees.
 - 4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
 - a. Reducing size of waste piping in direction of flow is prohibited.
- J. Lay buried building waste piping beginning at low point of each system.
 - 1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
 - 2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
 - 3. Maintain swab in piping and pull past each joint as completed.
- K. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Waste: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
 - 2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- L. Install steel piping according to applicable plumbing code.

- M. Install aboveground PVC piping according to ASTM D 2665.
- N. Install underground PVC piping according to ASTM D 2321.
- O. Plumbing Specialties:
 - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
 - 2. Install drains in sanitary waste gravity-flow piping.
 - a. Comply with requirements for drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
- P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors.
 - 1. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- R. Install sleeve seals for piping penetrations of concrete walls and slabs.
 - 1. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors.
 - 1. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. 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 ODs.
 - 2. In Waste Drainage Piping: Unshielded, nonpressure transition couplings.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
- C. Support horizontal piping and tubing within 12 inches (300 mm) of each fitting.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.
- F. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
 - 2. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
 - 3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
 - 4. NPS 6 and NPS 8 (DN 150 and DN 200): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.
- G. Install supports for vertical PVC piping every 48 inches (1200 mm).
- H. Support piping and tubing not listed above according to MSS SP-58 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect waste and vent piping to the following:
 - 1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Comply with requirements for cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."

5. Equipment: Connect waste piping as indicated.
 - a. Provide shutoff valve if indicated and union for each connection.
 - b. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.7 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping.
- B. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
 - a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.
 - a. Expose work that was covered or concealed before it was tested.
 3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
 - a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa).

- b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
- c. Inspect joints for leaks.
- 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.
 - a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa).
 - b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
 - c. Air pressure must remain constant without introducing additional air throughout period of inspection.
 - d. Inspect plumbing fixture connections for gas and water leaks.
- 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
- 6. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.
- E. Repair damage to adjacent materials caused by waste and vent piping installation.

3.10 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping shall be the following:
 - 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- C. Aboveground, vent piping shall be any of the following:
 - 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

D. Underground, soil, waste, and vent piping shall be the following:

1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
2. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION

SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Cleanouts.
 - 2. Trap seal guard
 - 3. Roof flashing assemblies.
 - 4. Through-penetration firestop assemblies.
 - 5. Miscellaneous sanitary drainage piping specialties.

1.3 DEFINITIONS

- A. PVC: Polyvinyl chloride.

1.4 ACTION SUBMITTALS

- A. Shop Drawings:
 - 1. Show fabrication and installation details for frost-resistant vent terminals.
 - 2. Wiring Diagrams: Power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For sanitary waste piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 PRODUCTS**2.1 ASSEMBLY DESCRIPTIONS**

- A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14 for plastic sanitary waste piping specialty components.

2.2 CLEANOUTS

- A. Cast-Iron Exposed Cleanouts:
 - 1. Standard: ASME A112.36.2M.
 - 2. Size: Same as connected drainage piping
 - 3. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
 - 4. Closure: Countersunk or raised-head, brass plug.
 - 5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
- B. Cast-Iron Exposed Floor Cleanouts:
 - 1. Standard: ASME A112.36.2M for heavy-duty, adjustable housing cleanout.
 - 2. Size: Same as connected branch.
 - 3. Body or Ferrule: Cast iron.
 - 4. Outlet Connection: Inside calk/Threaded.
 - 5. Closure: Brass plug with straight threads and gasket.
 - 6. Adjustable Housing Material: Cast iron with threads.
 - 7. Frame and Cover Material and Finish: Polished bronze/Rough bronze.
 - 8. Frame and Cover Shape: Round.
 - 9. Top Loading Classification: Heavy Duty.
 - 10. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
- C. Cast-Iron Wall Cleanouts:
 - 1. Standard: ASME A112.36.2M. Include wall access.
 - 2. Size: Same as connected drainage piping.
 - 3. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.

4. Closure Plug:
 - a. Brass.
 - b. Countersunk or raised head.
 - c. Drilled and threaded for cover attachment screw.
 - d. Size: Same as or not more than one size smaller than cleanout size.
5. Wall Access: Square, stainless-steel wall-installation frame and cover. Provide lockable cover for public areas.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Description: Manufactured assembly made of 6.0-lb/sq. ft., 0.0938-inch-thick, lead flashing collar and skirt extending at least 10 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
 - a. Low-Silhouette Vent Cap: With vandal-proof vent cap.

2.4 TRAP SEAL GUARDS

1. Josam 88240 series trap seal inserts, flexible silicone sealing ribs to prevent odors and sewer gases.

2.5 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Standard: UL 1479 assembly of sleeve-and-stack fitting with firestopping plug.
2. Size: Same as connected soil, waste, or vent stack.
3. Sleeve: Molded-PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
4. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
5. Special Coating: Corrosion resistant on interior of fittings.

2.6 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Deep-Seal Traps for all floor drains:

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 and smaller: 4-inch-minimum water seal.
 - b. NPS 2-1/2 (DN 65) and Larger: 5-inch-minimum water seal.
- B. 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.
- C. 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.
- D. 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.
- E. 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.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.

2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 4. Locate at base of each vertical soil and waste stack.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
 - C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
 - D. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof. Comply with requirements in the Division 07 specifications.
 - E. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof. Comply with requirements in the Division 07 specifications.
 - F. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.
 1. Comply with requirements in the Division 07 specifications.
 - G. Install deep-seal traps on all floor drains.
 - H. Install trap-seal guards on inlet to floor drains.
 - I. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
 - J. Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane.
 - K. Install vent caps on each vent pipe passing through roof.
 - L. Install wood-blocking reinforcement for wall-mounting-type specialties.
 - M. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

- A. Comply with requirements in Section 22 13 16 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

- A. Comply with requirements in the Division 07 specifications.

- 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 the Division 07 specifications.
- 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

- 1. Nameplates and signs are specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections, and prepare test reports.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.6 PROTECTION

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

END OF SECTION

SECTION 22 13 19.13 - SANITARY DRAINS**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. Floor drains.

1.3 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.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 PRODUCTS**2.1 DRAIN ASSEMBLIES**

- A. Sanitary drains shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14 for plastic sanitary piping specialty components.

2.2 FLOOR DRAINS

- A. Floor Drains:
 - 1. Products to match the scheduled fixture constructions or approved equal.

2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required for only for mezzanine mechanical room floor drains.
6. Anchor Flange: Required for only for mezzanine mechanical room floor drains.
7. Clamping Device: Required for only for mezzanine mechanical room floor drains.
8. Outlet: Bottom.
9. Top Shape: Round.
10. Top Loading Classification: Heavy Duty for Mechanical room and Medium Duty for all other areas.
11. Trap Pattern: Deep-seal P-trap.
12. Trap Features: Cleanout.
13. Waterless trap seal/guard: Each floor drain should be provided with EPDM or Silicone-based trap seal protection device, which carry a ASSE-1072 test and certification.

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 (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
 - b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
 - c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) 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. Comply with ASME A112.3.1 for installation of stainless-steel channel drainage systems.

1. 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. Install piping adjacent to equipment to allow service and maintenance.

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 22 14 13 - FACILITY STORM DRAINAGE PIPING**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. PVC pipe and fittings.
 - 2. Specialty pipe and fittings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For roof drainage system. Include calculations, plans, and details.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Detail storm drainage piping. Show support locations, type of support, weight on each support, required clearances, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Structural members to which drainage piping will be attached or suspended from.
- B. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Storm Drainage Piping:[10-foot head of water (30 kPa).

2.2 PVC PIPE AND FITTINGS

- A. NSF Marking: Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.
- B. Solid-Wall PVC sch 40 Pipe: ASTM D 2665; drain, waste, and vent.
- C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- D. Adhesive Primer: ASTM F 656.
- E. Solvent Cement: ASTM D 2564.

2.3 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
 - 1. General Requirements: Fitting or device for joining piping with small differences in ODs 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. Standard: ASTM C 1173.
 - b. Description: Elastomeric sleeve, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. 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.
 - 4. Shielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1460.
 - b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. End Connections: Same size as and compatible with pipes to be joined.

PART 3 - EXECUTION**3.1 EARTH MOVING**

- A. Comply with requirements for excavating, trenching, and backfilling specified elsewhere in the specifications.

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
 - 1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
 - 2. Install piping as indicated unless deviations from 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. Install piping to allow application of insulation.
- I. Make changes in direction for piping using appropriate branches, bends, and long-sweep bends.
 - 1. Do not change direction of flow more than 90 degrees.
 - 2. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
 - a. Reducing size of drainage piping in direction of flow is prohibited.
- J. Lay buried building piping beginning at low point of each system.
 - 1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
 - 2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

- 3. Maintain swab in piping and pull past each joint as completed.
- K. Install piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Storm Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
- L. Install steel piping according to applicable plumbing code.
- M. Install underground PVC piping according to ASTM D 2321.
- N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- O. Install sleeves for piping penetrations of walls, ceilings, and floors.
 - 1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- P. Install sleeve seals for piping penetrations of concrete walls and slabs.
 - 1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- Q. Install escutcheons for piping penetrations of walls, ceilings, and floors.
 - 1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Plastic, Nonpressure-Piping, Solvent-Cemented 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 appendices.

3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in ODs.
 - 2. In Drainage Piping: Unshielded/Shielded, nonpressure transition couplings.

3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect storm drainage piping to roof drains and storm drainage specialties.
 - 1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
 - 2. Comply with requirements for cleanouts and drains specified in Section 221423 "Storm Drainage Piping Specialties."

3.6 IDENTIFICATION

- A. Identify exposed storm drainage piping.
- B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
 - a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved.
 - a. Expose work that was covered or concealed before it was tested.
 - 3. Test Procedure:
 - a. Test storm drainage piping on completion of roughing-in.
 - b. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.
 - 4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

- 5. Prepare reports for tests and required corrective action.
- C. Piping will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.8 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.

3.9 PIPING SCHEDULE

- A. Underground storm drainage piping shall be the following:
 - 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 2. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION

SECTION 22 14 23 - STORM DRAINAGE PIPING SPECIALTIES**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Miscellaneous storm drainage piping specialties.
 - 2. Cleanouts.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 PRODUCTS**2.1 CLEANOUTS**

- A. Cast-Iron Exposed Cleanouts:
 - 1. Standard: ASME A112.36.2M.
 - 2. Size: Same as connected branch.
 - 3. Body Material: No-hub, cast-iron soil pipe test tee as required to match connected piping.
 - 4. Closure: Raised head, cast-iron plug.
 - 5. Closure Plug Size: Same as, or not more than, one size smaller than cleanout size.
- B. Cast-Iron Wall Cleanouts:
 - 1. Standard: ASME A112.36.2M. Include wall access.
 - 2. Size: Same as connected drainage piping.

3. Body: No-hub, cast-iron soil pipe test tee as required to match connected piping.
 4. Closure Plug:
 - a. Cast iron.
 - b. Countersunk head.
 - c. Drilled and threaded for cover attachment screw.
 - d. Size: Same as, or not more than, one size smaller than cleanout size.
 5. Wall Access: Square, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.
- C. Test Tees:
1. Standard: ASME A112.36.2M and ASTM A 74, ASTM A 888, or CISPI 301.
 2. Size: Same as connected drainage piping.
 3. Body Material: Hub-and-spigot, cast-iron soil-pipe T-branch or no-hub, cast-iron soil-pipe test tee as required to match connected piping.
 4. Closure Plug: Countersunk, brass.
 5. Closure Plug Size: Same as, or not more than, one size smaller than cleanout size.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cleanouts in building drain piping according to the following instructions unless otherwise indicated:
 1. Use cleanouts the same size as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
 2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
 3. Locate cleanouts at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
- 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 test tees in vertical conductors and near floor.
- E. Install wall cleanouts in vertical conductors. Install access door in wall.

F. Install through-penetration firestop assemblies for penetrations of fire- and smoke-rated assemblies.

1. Comply with requirements in Section 07 84 13 "Penetration Firestopping."

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 22 14 13 "Facility Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 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 22 21 13 - CONDENSATE PIPING**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Copper tube and fittings.
 - 2. Joining materials.
 - 3. Transition fittings.
 - 4. Dielectric fittings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Pipe and tube.
 - 2. Fittings.
 - 3. Joining materials.
 - 4. Transition fittings.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installers of Pressure-Sealed Joints: Installers shall be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Condensate piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
 - 1. Condensate-Drain Piping: 180 deg F.

2.2 COPPER TUBE AND FITTINGS

- A. DWV Copper Tube: ASTM B306, Type DWV.
- B. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings.
- D. Cast Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
- E. Wrought Copper Unions: ASME B16.22.
- F. Copper-Tube, Pressure-Seal-Joint Fittings:
 - 1. Fittings: Cast-brass, cast-bronze, or wrought-copper with EPDM O-ring seal in each end.
 - 2. Minimum 200-psig (1379-kPa) working-pressure rating at 250 deg F (121 deg C).

2.3 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness unless otherwise indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux according to ASTM B813.
- C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

2.4 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 - 1. Description:
 - a. Standard: ASSE 1079.
 - b. Pressure Rating: 125 psig minimum at 180 deg F
 - c. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
 - 1. Description:
 - a. Standard: ASSE 1079.
 - b. Factory-fabricated, bolted, companion-flange assembly.
 - c. Pressure Rating: 125 psig minimum at 180 deg F.

- d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric Nipples:
- 1. Description:
 - a. Standard: IAPMO PS 66.
 - b. Electroplated steel nipple, complying with ASTM F1545.
 - c. Pressure Rating: 300 psig at 225 deg F.
 - d. End Connections: Male threaded or grooved.
 - e. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Condensate-Drain Piping, Copper: Type DWV, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

3.2 INSTALLATION OF PIPING

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- 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. Install piping to allow application of insulation.
- I. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- J. Comply with requirements in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for identifying piping.
- K. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- L. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

- M. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "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 pipe and fittings before assembly.
- C. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B32.
- D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.

3.4 INSTALLATION OF DIELECTRIC FITTINGS

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples or unions.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment" for hangers, supports, and anchor devices.
- B. Install hangers for copper tubing, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- C. Support horizontal piping within 12 inches of each fitting and coupling.

3.6 EQUIPMENT CONNECTIONS

- A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

3.7 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

END OF SECTION