

03/03/2023

100 CD

PCCD – Laney College

900 Fallon St
Oakland, CA 94607

Peralta Community College District

333 East Eighth Street
Oakland, CA 9460690



DIALOG®

Dialog Design
681 4th Street
Oakland, CA 94607
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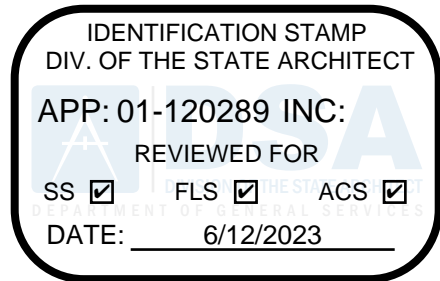
SIGNATURE PAGE



Dong Kim, DIALOG Design
Architect of Record



Taeho Um, Taeho Um & Associates
Structural Consultant



 02/02/2023



Gary Henning, H&M Mechanical Group
Mechanical Consultant



Jose We, WKM Electrical Consultants Inc.
Electrical Consultant

DOCUMENT 00 0115

LIST OF DRAWING SHEETS

1.1 DRAWINGS

Architectural Drawings: Drawings consist of the Contract Drawings and other drawings listed on the Table of Contents page of the separately bound drawing set titled PCCD Laney College Fab Workshop Relocation, dated 02/03/2023, as modified by subsequent Addenda and Contract modifications.

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END OF DOCUMENT

SECTION 01 1000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Owner's product purchase contracts.
 - 4. Owner-furnished/Contractor-installed (OFCI) products.
 - 5. Owner-furnished/Owner-installed (OFOI) products.
 - 6. Contractor-furnished/Owner-installed (CFOI) products.
 - 7. Contractor's use of site and premises.
 - 8. Coordination with occupants.
 - 9. Work restrictions.
 - 10. Specification and Drawing conventions.
 - 11. Miscellaneous provisions.
- B. Related Requirements:
 - 1. Section 01 5000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 DEFINITIONS

- A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

1.4 PROJECT INFORMATION

- A. Project Identification: PCCD Laney College Fabrication Workshop Relocation Project.
 - 1. Project Location: Art Building 900 Fallon Street, Oakland, CA 94607
- B. Owner: Peralta Community College District
 - 1. Owner's Representative: Amy Marshall, Peralta Community College District
- C. Architect: DIALOG Design.
 - 1. Architect's Representative: Dong Kim

- D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:
 - 1. Structural: Taeho Um, Taeho Um & Associates
 - 2. Mechanical & Plumbing: Gary Henning, H&M Mechanical Group
 - 3. Electrical: Jose We, WKM Electrical Consultants Inc.

- E. Construction Manager: Swinerton
 - 1. Construction Manager Representative: Zebediah Butscher
 - 2. Construction Manager has been engaged for this Project to serve as an advisor to Owner and to provide assistance in administering the Contract for construction between Owner and Contractor, according to a separate contract between Owner and Construction Manager.
 - a. Construction Manager also serves as Project coordinator, as defined in Section 01 1200 "Multiple Contract Summary."
 - 3. Construction Manager for this Project is Project's constructor. The terms "Construction Manager" and "Contractor" are synonymous.

- F. Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.
 - 1. See Section 01 3100 "Project Management and Coordination." for requirements for using web-based Project software.

1.5 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
 - a. Construction of equipment rooms
 - b. Relocation of existing equipment
 - c. Restroom Improvement
 - d. Construction of outdoor canopy

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

1.6 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFICI) PRODUCTS

- A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:
 - 1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
 - 2. Provide for delivery of Owner-furnished products to Project site.
 - 3. Upon delivery, inspect, with Contractor present, delivered items.
 - a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.
 - 4. Obtain manufacturer's inspections, service, and warranties.
 - 5. Inform Contractor of earliest available delivery date for Owner-furnished products.

- B. Contractor's Responsibilities: The Work includes the following, as applicable:
1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
 2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
 3. Receive, unload, handle, store, protect, and install Owner-furnished products.
 4. Make building services connections for Owner-furnished products.
 5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
 6. Repair or replace Owner-furnished products damaged following receipt.
- C. Owner-Furnished/Contractor-Installed (OFCI) Products:
1. **<Insert description, in separate subparagraphs, for each Owner-furnished/Contractor-installed product>.**

1.7 OWNER-FURNISHED/OWNER-INSTALLED (OFOI) PRODUCTS

- A. The Owner will furnish and install products indicated.
- B. Owner-Furnished/Owner-Installed (OFOI) Products:
1. **<Insert description, in separate subparagraphs, for each Owner-furnished/Owner-installed product>.**

1.8 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Unrestricted Use of Site: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- C. Limits on Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Limits on Use of Site: Confine construction operations to project areas.
 2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- D. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

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

1.9 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy Project site and existing adjacent room(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
 - 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.
- B. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 - 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- C. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
 - 1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
 - 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
 - 3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
 - 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.10 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

- B. On-Site Work Hours: Limit work to between 7 a.m. to 6 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
 - 1. Weekend Hours: <Insert restrictions on times permitted for weekend work>.
 - 2. Early Morning Hours: <Insert restrictions or references to regulations by authorities having jurisdiction for restrictions on noisy work>.
 - 3. Work in Existing Building: <Insert restrictions on times permitted and other Owner's restrictions>.
 - 4. Hours for Utility Shutdowns: <Insert Owner's restrictions>.
 - 5. Hours for [Core Drilling] <Insert noisy activity>: <Insert Owner's restrictions>.
- C. On-Site Work Day Restrictions: Do not perform work resulting in utility shutdowns or resulting in noisy activity on-site during work black-out days indicated in Document 003113 "Preliminary Schedules."
- D. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
 - 1. Notify Construction Manager not less than two days in advance of proposed utility interruptions.
 - 2. Obtain Construction Manager's written permission before proceeding with utility interruptions.
- E. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Construction Manager not less than two days in advance of proposed disruptive operations.
 - 2. Obtain Construction Manager's written permission before proceeding with disruptive operations.
- F. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances within the existing building on Project site on Owner's property is not permitted.
- G. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- H. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.11 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
 3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 1000

SECTION 01 2100 - ALLOWANCES

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 governing allowances.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.
 - 2. Unit-cost allowances.
 - 3. Quantity allowances.
 - 4. Contingency allowances.
 - 5. Testing and inspecting allowances.
- C. Related Requirements:
 - 1. Section 01 2200 "Unit Prices" for procedures for using unit prices, including adjustment of quantity allowances when applicable.
 - 2. Section 01 2600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
 - 3. Section 01 4000 "Quality Requirements" for procedures governing the use of allowances for field testing by an independent testing agency.

1.3 DEFINITIONS

- A. Allowance: A quantity of work or dollar amount included in the Contract, established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.4 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

1.5 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.6 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.7 LUMP-SUM ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.8 UNIT-COST ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.9 QUANTITY ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.10 CONTINGENCY ALLOWANCES

- A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.
- C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit.
- D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.11 TESTING AND INSPECTING ALLOWANCES

- A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.
- B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.
- C. Costs of testing and inspection services not specifically required by the Contract Documents are Contractor responsibilities and are not included in the allowance.
- D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.12 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement

of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, required maintenance materials, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
 3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs due to a change in the scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. *Allowance No. 1: Lump-Sum Allowance: Include the sum of \$2,000.00 for removing exiting furnishing.*
1. *This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.*
- B. *Allowance No. 2: Lump-Sum Allowance: Include the sum of \$2,500.00 for miscellaneous mechanical demo.*

1. *This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.*
- C. *Allowance No. 3: Lump-Sum Allowance: Include the sum of \$5,000.00 for demo subfloor & sawcut.*
1. *This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.*
- D. *Allowance No. 4: Lump-Sum Allowance: Include the sum of \$3,000.00 for miscellaneous electrical demo.*
1. *This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.*
- E. *Allowance No. 5: Lump-Sum Allowance: Include the sum of \$2,000.00 for miscellaneous equipment demo or salvage.*
1. *This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.*
- F. *Allowance No. 6: Lump-Sum Allowance: Include the sum of \$10,000.00 for miscellaneous accessibility demo.*
1. *This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.*
- G. *Allowance No. 7: Lump-Sum Allowance: Include the sum of \$x,000.00 for restroom accessibility update.*
1. *This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.*
- H. **Allowance No. 8: Lump-Sum Allowance: Include the sum of \$5,000.00 for projector and screen.**
1. **This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.**
- I. *Allowance No. 7: Lump-Sum Allowance: Include the sum of \$70,000.00 for DSA-approved outdoor canopy construction.*
1. *This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.*
- J. **Allowance No. 8: Lump-Sum Allowance: Include the sum of \$5,000.00 for dust collection system reinstallation including ducts.**
1. **This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.**
- K. *Allowance No. 9: Lump-Sum Allowance: Include the sum of \$20,000.00 for electrical update.*
1. *This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.*

END OF SECTION 01 2100

SECTION 01 2500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Document 002600 "Procurement Substitution Procedures" for requirements for substitution requests prior to award of Contract.
 - 2. Section 01 2100 "Allowances" for products selected under an allowance.
 - 3. Section 01 2300 "Alternates" for products selected under an alternate.
 - 4. Section 01 6000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

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

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use form acceptable to Architect.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
 - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.

- c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

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

1.6 PROCEDURES

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

1.7 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Not allowed unless otherwise indicated.
- C. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Substitution request is fully documented and properly submitted.
 - e. Requested substitution will not adversely affect Contractor's construction schedule.
 - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - g. Requested substitution is compatible with other portions of the Work.
 - h. Requested substitution has been coordinated with other portions of the Work.
 - i. Requested substitution provides specified warranty.
 - j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2500

SECTION 01 3233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction photographs.
 - 2. Concealed Work photographs.
 - 3. Periodic construction photographs.
 - 4. Final Completion construction photographs.
 - 5. Preconstruction video recordings.
 - 6. Periodic construction video recordings.
 - 7. Construction webcam.
- B. Related Requirements:
 - 1. Section 01 7700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
 - 2. Section 01 7900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
 - 3. Section 02 4116 "Structure Demolition" for photographic documentation before building demolition operations commence.
 - 4. Section 02 4119 "Selective Demolition" for photographic documentation before selective demolition operations commence.
 - 5. Section 31 1000 "Site Clearing" for photographic documentation before site clearing operations commence.

1.3 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within seven days of taking photographs.
 - 1. Submit photos by uploading to web-based Project management software site. Include copy of key plan indicating each photograph's location and direction.
 - 2. Identification: Provide the following information with each image description in web-based Project management software site:
 - a. Name of Project.
 - b. Date photograph was taken.

- C. Video Recordings: Submit video recordings within seven days of recording.
 - 1. Submit video recordings by uploading to web-based Project management software site. Include copy of key plan indicating each video's location and direction.
 - 2. Identification: With each submittal, provide the following information on web-based Project management software site:
 - a. Name of Project.
 - b. Date video recording was recorded.

1.4 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.
- B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full high-definition mode with vibration-reduction technology. Provide supplemental lighting in low light levels or backlit conditions.
- C. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- D. Metadata: Record accurate date and time from camera.
- E. File Names: Name media files with date Project area and sequential numbering suffix.

1.5 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs with maximum depth of field and in focus.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Construction Manager.
 - 1. Flag construction limits before taking construction photographs.
 - 2. Take photographs to show existing conditions adjacent to property before starting the Work.
 - 3. Take photographs of existing buildings either on or adjoining property, to accurately record physical conditions at start of construction.
 - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:

1. Underground utilities.
 2. Underslab services.
 3. Piping.
 4. Electrical conduit.
 5. Waterproofing and weather-resistant barriers.
- E. Periodic Construction Photographs: Take photographs weekly. Select vantage points to show status of construction and progress since last photographs were taken.
- F. Final Completion Construction Photographs: Take photographs after date of Substantial Completion for submission as Project Record Documents. Construction Manager will inform photographer of desired vantage points.

1.6 CONSTRUCTION VIDEO RECORDINGS

- A. Video Recording Photographer: Engage a qualified videographer to record construction video recordings.
- B. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.
1. Confirm date and time at beginning and end of recording.
 2. Begin each video recording with name of Project, Contractor's name, videographer's name, and Project location.
- C. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from video recording opposite the corresponding narration segment.
- D. Preconstruction Video Recording: Before starting demolition, record video recording of Project site and surrounding properties from different vantage points, as directed by Construction Manager.
1. Flag construction limits before recording construction video recordings.
 2. Show existing conditions adjacent to Project site before starting the Work.
 3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of demolition.
 4. Show protection efforts by Contractor.
- E. Periodic Construction Video Recordings: Record video recording weekly. Select vantage points to show status of construction and progress since last video recordings were recorded.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 3233

SECTION 01 3300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Submittal schedule requirements.
 - 2. Administrative and procedural requirements for submittals.
- B. Related Requirements:
 - 1. Section 01 3233 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and Final Completion construction photographs.
 - 2. Section 01 4000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
 - 3. Section 01 7700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
 - 4. Section 01 7823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 5. Section 01 7839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 6. Section 01 7900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

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

1.4 SUBMITTAL SCHEDULE

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

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal Schedule: 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 Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled dates for purchasing.
 - h. Scheduled date of fabrication.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.5 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
 1. Project name.
 2. Date.
 3. Name of Architect.
 4. Name of Construction Manager.
 5. Name of Contractor.
 6. Name of firm or entity that prepared submittal.
 7. Names of subcontractor, manufacturer, and supplier.
 8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
 9. Category and type of submittal.
 10. Submittal purpose and description.
 11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 12. Drawing number and detail references, as appropriate.
 13. Indication of full or partial submittal.
 14. Location(s) where product is to be installed, as appropriate.
 15. Other necessary identification.
 16. Remarks.
 17. Signature of transmitter.
- B. Options: Identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on

previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

- D. Paper Submittals:
1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Action Submittals: Submit five paper copies of each submittal unless otherwise indicated. Architect will return two copies.
 4. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 5. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using transmittal form.
- E. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- F. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

1.6 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
 - a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
 2. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
 3. Paper: Prepare submittals in paper form and deliver to Architect.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.

- a. Architect and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Architect's and Construction Manager's action stamp.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's and Construction Manager's action stamp.

1.7 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:

- a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.
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. Paper 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.
 - a. Five opaque copies of each submittal. Architect and Construction Manager will retain two copies; remainder will be returned.
- C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.
 4. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
 5. Paper Transmittal: Include paper transmittal, including complete submittal information indicated.
 6. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

- a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
7. 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 four full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through Construction Manager, will return submittal with options selected.
8. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
- a. Number of Samples: Submit three sets of Samples. Architect and Construction Manager will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
- 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 - 2. Manufacturer and product name, and model number if applicable.
 - 3. Number and name of room or space.
 - 4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

1.8 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents.

Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and Construction Manager.

- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 - 1. Architect and Construction Manager will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ARCHITECT'S AND CONSTRUCTION MANAGER'S REVIEW

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.
 - 1. Submittals: Architect will indicate, via markup on each submittal, the appropriate action, as follows:
 - a. Reviewed: Submittal is in general conformation of the project requirement and the architect does not have exceptions.
 - b. Reviewed for Reference Only: Submittal review is not required by Architect; however, the submittal has been reviewed for awareness only.
 - c. Furnished as corrected: Submittal has been reviewed and architect has comments as marked. No resubmittal is required.
 - d. Revise and Resubmit: Submittal has been reviewed and comments have been added illustrating resubmittal needs. Resubmittal is required.
 - e. Rejected: Material submitted does not meet the project requirement and is rejected.
- B. Informational Submittals: Architect and Construction Manager will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect and Construction Manager will forward each submittal to appropriate party.
- C. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- D. Architect and Construction Manager will discard submittals received from sources other than Contractor.
- E. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 3300

SECTION 01 4000 - 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 Architect, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Requirements:
 - 1. Section 01 2100 "Allowances" for testing and inspection allowances.

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: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.
 - 1. Mockups are used for one or more of the following:
 - a. Verify selections made under Sample submittals.
 - b. Demonstrate aesthetic effects.
 - c. Demonstrate the qualities of products and workmanship.
 - d. Demonstrate successful installation of interfaces between components and systems.
 - e. Perform preconstruction testing to determine system performance.
 - 2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
 - 3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
- E. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- F. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."
- G. 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.
- H. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect or Construction Manager.

1.4 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- 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 Architect regarding the conflict and

obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

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

1.6 ACTION SUBMITTALS

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

1.7 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 - 2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- F. Reports: Prepare and submit certified written reports and documents as specified.

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

1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.
- B. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- C. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
 - 2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
 - 3. Owner-performed tests and inspections indicated in the Contract Documents.
- D. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- E. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.9 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, telephone number, and email address of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 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.

1.10 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. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.
 - 1. Requirements of authorities having jurisdiction supersede requirements for specialists.
- G. 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.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, 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.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups of size indicated.
 - 2. Build mockups in location indicated or, if not indicated, as directed by Architect or Construction Manager.
 - 3. Notify Architect and Construction Manager seven 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 Architect's and Construction Manager's approval of mockups before starting corresponding Work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 - 7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
 - 8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect 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.

1.11 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.

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

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

- D. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect, Construction Manager, 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 01 3300 "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. Delivery of samples to testing agencies.
 - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 - 7. Security and protection for samples and for testing and inspection equipment at Project site.
- H. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. **Schedule of Tests and Inspections:** Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.
 - 1. **Schedule Contents:** Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
 - 2. **Distribution:** Distribute schedule to Owner, Architect, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.12 SPECIAL TESTS AND INSPECTIONS

- A. **Special Tests and Inspections:** Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in the Statement of Special Inspections attached to this Section, and as follows:
 - 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures, and reviewing the completeness and adequacy of those procedures to perform the Work.
 - 2. Notifying Architect, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 - 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect, through Construction Manager, with copy to Contractor and to authorities having jurisdiction.

4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

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

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 7300 "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.

3.3 STATEMENT OF SPECIAL INSPECTIONS

- A. SOILS
 1. Table 1705.6
 - a. Verify use of proper materials, densities and inspect lift thicknesses placement and compacting during placement of fill.
 - b. Compaction Testing
- B. CONCRETE

1. Per Table 1705.3
 - a. Verify use of required design mix
 - b. During concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.
 - c. Test concrete strength.
2. Post Installed Anchors
 - a. Inspect anchors post installed in hardened concrete members.

END OF SECTION 01 4000

SECTION 01 4200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Abbreviations and acronyms not included in this list shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States." The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents.

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

30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASSP - American Society of Safety Professionals (The); www.assp.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AVIXA - Audiovisual and Integrated Experience Association; (Formerly: Infocomm International); www.soundandcommunications.com.
38. AWEA - American Wind Energy Association; www.awea.org.
39. AWI - Architectural Woodwork Institute; www.awinet.org.
40. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
41. AWPA - American Wood Protection Association; www.awpa.com.
42. AWS - American Welding Society; www.aws.org.
43. AWWA - American Water Works Association; www.awwa.org.
44. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
45. BIA - Brick Industry Association (The); www.gobrick.com.
46. BICSI - BICSI, Inc.; www.bicsi.org.
47. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
48. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
49. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
50. CDA - Copper Development Association; www.copper.org.
51. CE - Conformite Europeenne; www.ec.europa.eu/growth/single-market/ce-marking.
52. CEA - Canadian Electricity Association; www.electricity.ca.
53. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
54. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
55. CGA - Compressed Gas Association; www.cganet.com.
56. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
57. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
58. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
59. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
60. CPA - Composite Panel Association; www.compositepanel.org.
61. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
62. CRRC - Cool Roof Rating Council; www.coolroofs.org.
63. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
64. CSA - CSA Group; www.csa-group.org.
65. CSI - Construction Specifications Institute (The); www.csiresources.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTA - Consumer Technology Association; www.cta.tech.
68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.coolingtechnology.org.
69. CWC - Composite Wood Council; (See CPA).
70. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
71. DHA - Decorative Hardwoods Association; (Formerly: Hardwood Plywood & Veneer Association); www.decorativehardwoods.org.
72. DHI - Door and Hardware Institute; www.dhi.org.
73. ECA - Electronic Components Association; (See ECIA).
74. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
75. ECIA - Electronic Components Industry Association; www.ecianow.org.
76. EIA - Electronic Industries Alliance; (See TIA).

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

127. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
128. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
129. MHI - Material Handling Industry of America; www.mhia.org.
130. MIA - Marble Institute of America; (See NSI).
131. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
132. MPI - Master Painters Institute; www.paintinfo.com.
133. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
134. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
135. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
136. NADCA - National Air Duct Cleaners Association; www.nadca.com.
137. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
138. NALP - National Association of Landscape Professionals; www.landscapeprofessionals.org.
139. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
140. NBI - New Buildings Institute; www.newbuildings.org.
141. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
142. NCMA - National Concrete Masonry Association; www.ncma.org.
143. NEBB - National Environmental Balancing Bureau; www.nebb.org.
144. NECA - National Electrical Contractors Association; www.necanet.org.
145. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
146. NEMA - National Electrical Manufacturers Association; www.nema.org.
147. NETA - InterNational Electrical Testing Association; www.netaworld.org.
148. NFHS - National Federation of State High School Associations; www.nfhs.org.
149. NFPA - National Fire Protection Association; www.nfpa.org.
150. NFPA - NFPA International; (See NFPA).
151. NFRC - National Fenestration Rating Council; www.nfrc.org.
152. NGA - National Glass Association (The); (Formerly: Glass Association of North America); www.glass.org.
153. NHLA - National Hardwood Lumber Association; www.nhla.com.
154. NLGA - National Lumber Grades Authority; www.nlga.org.
155. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
156. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
157. NRCA - National Roofing Contractors Association; www.nrca.net.
158. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
159. NSF - NSF International; www.nsf.org.
160. NSI - National Stone Institute; (Formerly: Marble Institute of America); www.naturalstoneinstitute.org.
161. NSPE - National Society of Professional Engineers; www.nspe.org.
162. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
163. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
164. NWFA - National Wood Flooring Association; www.nwfa.org.
165. NWRA - National Waste & Recycling Association; www.wasterecycling.org.
166. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
167. PDI - Plumbing & Drainage Institute; www.pdionline.org.
168. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
169. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
170. RFCI - Resilient Floor Covering Institute; www.rfci.com.
171. RIS - Redwood Inspection Service; www.redwoodinspection.com.
172. SAE - SAE International; www.sae.org.
173. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
174. SDI - Steel Deck Institute; www.sdi.org.
175. SDI - Steel Door Institute; www.steeldoor.org.
176. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.

177. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
178. SIA - Security Industry Association; www.siaonline.org.
179. SJI - Steel Joist Institute; www.steeljoist.org.
180. SMA - Screen Manufacturers Association; www.smainfo.org.
181. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
182. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
183. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
184. SPIB - Southern Pine Inspection Bureau; www.spib.org.
185. SPRI - Single Ply Roofing Industry; www.spri.org.
186. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
187. SSINA - Specialty Steel Industry of North America; www.ssina.com.
188. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
189. STI - Steel Tank Institute; www.steeltank.com.
190. SWI - Steel Window Institute; www.steelwindows.com.
191. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
192. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
193. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
194. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
195. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
196. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
197. TMS - The Masonry Society; www.masonrysociety.org.
198. TPI - Truss Plate Institute; www.tpinst.org.
199. TPI - Turfgrass Producers International; www.turfgrassod.org.
200. TRI - Tile Roofing Institute; www.tilerroofing.org.
201. UL - Underwriters Laboratories Inc.; www.ul.com.
202. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
203. USAV - USA Volleyball; www.usavolleyball.org.
204. USGBC - U.S. Green Building Council; www.usgbc.org.
205. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
206. WA - Wallcoverings Association; www.wallcoverings.org.
207. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
208. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
209. WDMA - Window & Door Manufacturers Association; www.wdma.com.
210. WI - Woodwork Institute; www.wicnet.org.
211. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
212. WWPA - Western Wood Products Association; <http://www.wwpa.org>. Retain "Code Agencies" Paragraph below if required. The Section Text in MasterSpec Sections is prepared assuming list is retained.

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

1. DIN - Deutsches Institut für Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

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

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.

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

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

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.govinfo.gov.
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from General Services Administration; www.gsa.gov.
 - c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org.
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

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

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 4200

SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 01 1000 "Summary" for work restrictions and limitations on utility interruptions.
 - 2. Section 01 1200 "Multiple Contract Summary" for responsibilities for temporary facilities and controls for projects utilizing multiple contracts.
 - 3. Section 01 2100 "Allowances" for allowance for metered use of temporary utilities.

1.3 USE CHARGES

- A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Owner will pay sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Owner will pay water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Owner will pay electric-power-service use charges for electricity used by all entities for construction operations.
- E. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services and metering as required for construction operations.
- F. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services and metering as required for construction operations.
- G. Sewer, Water, and Electric Power Service: Use charges are specified in Section 01 1200 "Multiple Contract Summary."

1.4 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. 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 requirements for 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.
- F. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
 - 1. Locations of dust-control partitions at each phase of work.
 - 2. HVAC system isolation schematic drawing.
 - 3. Location of proposed air-filtration system discharge.
 - 4. Waste-handling procedures.
 - 5. Other dust-control measures.
- G. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:
 - 1. Methods used to meet the goals and requirements of the Owner.
 - 2. Concrete cutting method(s) to be used.
 - 3. Location of construction devices on the site.
 - 4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
 - 5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.
 - 6. Indicate locations of sensitive equipment areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in [the United States Access Board's ADA-ABA Accessibility Guidelines] [and] [ICC/ANSI A117.1].

1.6 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top rails.
- B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide galvanized-steel bases for supporting posts.
- C. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.
- D. Wood Enclosure Fence: Plywood, 8 feet high, framed with four 2-by-4-inch rails, with preservative-treated wood posts spaced not more than 8 feet apart.
- E. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.
- F. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.
- G. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

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

- B. Field Offices: Owner will provide conditioned interior space for field offices for duration of Project.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 01 7700 "Closeout Procedures."
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

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

3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Section 01 1000 "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.

- C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
 - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 - 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
 - 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- E. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- F. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
 - 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

- G. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- I. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.

3.4 SUPPORT FACILITIES INSTALLATION

- A. Comply with the following:
 - 1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
 - 2. Utilize designated area within existing building for temporary field offices.
 - 3. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
 - 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 - 2. Prepare subgrade and install subbase and base for temporary roads and paved areas in accordance with Section 31 2000 "Earth Moving."
 - 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
 - 4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course in accordance with Section 32 1216 "Asphalt Paving."
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: [Provide temporary offsite] [Use designated areas of Owner's existing] parking areas for construction personnel.
- E. Storage and Staging: [Provide temporary offsite area] [Use designated areas of Project site] for storage and staging needs.

- F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 - 2. Remove snow and ice as required to minimize accumulations.
- G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 - 3. Maintain and touch up signs, so they are legible at all times.
- H. Waste Disposal Facilities: Comply with requirements specified in Section 01 7419 "Construction Waste Management and Disposal."
- I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01 7300 "Execution."
- J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- K. Temporary Elevator Use: [Use of elevators is not permitted] [See Division 14 elevator Section for temporary use of new elevators].
- L. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
 - 1. Do not load elevators beyond their rated weight capacity.
 - 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work, so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- M. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- N. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
 - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas, so no evidence remains of correction work.

- O. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
 - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Section 01 1000 "Summary."
- C. Temporary Erosion and Sedimentation Control: Comply with requirements specified in Section 31 1000 "Site Clearing."
- D. 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, according to requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
 - 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- 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.
- E. 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.
- F. Tree and Plant Protection: Comply with requirements specified in Section 01 5639 "Temporary Tree and Plant Protection."
- G. 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.
- H. 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.

- I. Site Enclosure Fence: Before construction operations begin, 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 determined sufficient to accommodate construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- J. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- K. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- L. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.
- M. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.
 - 1. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
 - 2. Paint and maintain appearance of walkway for duration of the Work.
- N. 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.
- O. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
 - 1. Construct dustproof partitions with gypsum wallboard, with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
 - 2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
 - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
 - 3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 - 4. Insulate partitions to control noise transmission to occupied areas.
 - 5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 - 6. Protect air-handling equipment.

7. Provide walk-off mats at each entrance through temporary partition.
- P. 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 in accordance with requirements of authorities having jurisdiction.
 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- 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 porous 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. Remove standing water from decks.
 5. 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.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

- a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
- b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
- c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 7700 "Closeout Procedures."

END OF SECTION 01 5000

SECTION 01 6000 - PRODUCT 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 selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 01 1000 "Summary" for Contractor requirements related to Owner-furnished products.
 - 2. Section 01 2100 "Allowances" for products selected under an allowance.
 - 3. Section 01 2300 "Alternates" for products selected under an alternate.
 - 4. Section 01 2500 "Substitution Procedures" for requests for substitutions.
 - 5. Section 01 4200 "References" for applicable industry standards for products specified.
 - 6. Section 01770 "Closeout Procedures" for submitting warranties.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
 - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, 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 single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
 2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 01 3300 "Submittal Procedures."
- F. Substitution: Refer to Section 01 2500 "Substitution Procedures" for definition and limitations on substitutions.

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. Resolution of Compatibility Disputes between Multiple Contractors:
 - a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
 2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:

- a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.5 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft 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 that products are undamaged and properly protected.
- C. Storage:
1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
 2. Store products to allow for inspection and measurement of quantity or counting of units.
 3. Store materials in a manner that will not endanger Project structure.
 4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
 5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 7. Protect stored products from damage and liquids from freezing.
 8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to 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 in the Project Manual, prepare a written document, using indicated form properly executed.
 - 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 7700 "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. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected," Architect will make selection.
 - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 - 6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Architect, whose determination is final.
- B. Product Selection Procedures:

1. Sole 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.
 - a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."
2. Sole 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.
 - a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."
3. Limited List of Products: 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.
 - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
4. Non-Limited List of Products: 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.
 - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
5. Limited List of Manufacturers: 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 be considered.
 - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
6. Non-Limited List of Manufacturers: 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.
 - a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.
7. 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 may additionally 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.

- a. For approval of products by unnamed manufacturers, comply with requirements in Section 01 2500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect'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 2500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
- E. Sustainable Product Selection: Where Specifications require product to meet sustainable product characteristics, select products complying with indicated requirements. Comply with requirements in Division 01 sustainability requirements Section and individual Specification Sections.
 1. Select products for which sustainable design documentation submittals are available from manufacturer.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
 1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.
- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 01 3300 "Submittal Procedures."
 1. Form of Approval of Submittal: As specified in Section 01 3300 "Submittal Procedures."
 2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

- C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.
- D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 6000

SECTION 01 7300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner's portion of the Work.
 - 6. Coordination of Owner-installed products.
 - 7. Progress cleaning.
 - 8. Starting and adjusting.
 - 9. Protection of installed construction.
 - 10. Correction of the Work.

- B. Related Requirements:
 - 1. Section 01 1000 "Summary" for coordination of Owner-furnished products, and limits on use of Project site.
 - 2. Section 01 3300 "Submittal Procedures" for submitting surveys.
 - 3. Section 01 7700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
 - 4. Section 02 4119 "Selective Demolition" for demolition and removal of selected portions of the building.

1.2 DEFINITIONS

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

- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at Project site.
 - 1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect and Construction Manager of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
 - a. Contractor's superintendent.

- b. Trade supervisor responsible for cutting operations.
 - c. Trade supervisor(s) responsible for patching of each type of substrate.
 - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.
2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- B. Layout Conference: Conduct conference at Project site.
1. Prior to establishing layout of new and existing perimeter and structural column grid(s), review building location requirements. Review benchmark, control point, and layout and dimension requirements. Inform Architect and Construction Manager of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:
 - a. Contractor's superintendent.
 - b. Professional surveyor responsible for performing Project surveying and layout.
 2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
 3. Review requirements for including layouts on Shop Drawings and other submittals.
 4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certified Surveys: Submit two copies signed by land surveyor.
- C. Certificates: Submit certificate signed by land surveyor, certifying that location and elevation of improvements comply with requirements.
- D. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 4. Dates: Indicate when cutting and patching will be performed.
 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate 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.
- E. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 CLOSEOUT SUBMITTALS

- A. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.6 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Professional Engineer Qualifications: Refer to Section 01 4000 "Quality Requirements."
- C. 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, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect 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. Fire-suppression systems.
 - e. Plumbing piping 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 load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Sprayed fire-resistive material.
 - e. Equipment supports.
 - f. Piping, ductwork, vessels, and equipment.
 - g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where

indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. 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, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
 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 Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect through Construction Manager in accordance with requirements in Section 01 3100 "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 and existing conditions. If discrepancies are discovered, notify Architect and Construction Manager promptly.
- B. Engage a land surveyor experienced in laying out the Work, using the following accepted surveying practices:
1. Establish limits on use of Project site.
 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.
 4. Check the location, level and plumb, of every major element as the Work progresses.
 5. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Construction Manager.

3.4 INSTALLATION

- A. 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, unless otherwise indicated on Drawings.
- 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 satisfactory results as judged by Architect. 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 of type expected for Project.
- 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: Select tools or equipment that minimize production of excessive 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 portions of the 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 with manufacturer.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

3.5 CUTTING AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of Work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 01 1000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 COORDINATION OF OWNER'S PORTION OF THE WORK

- A. Site Access: Provide access to Project site for Owner's construction personnel.
1. Provide temporary facilities required for Owner-furnished, Contractor-installed products.
 2. Refer to Section 01 1000 "Summary" for other requirements for Owner-furnished, Contractor-installed and Owner-furnished, Owner-installed products.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel[**and Owner's separate contractors**].

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel and Owner's separate contractors at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

- A. 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: 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 7419 "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 ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 01 9113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 01 4000 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Restore permanent facilities used during construction to their specified condition.
- D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

- E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 7300

SECTION 01 7419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Section 01 1200 "Multiple Contract Summary" for coordination of responsibilities for waste management.
 - 2. Section 04 2000 "Unit Masonry" for disposal requirements for masonry waste.
 - 3. Section 04 4313.13 "Anchored Stone Masonry Veneer" for disposal requirements for excess stone and stone waste.
 - 4. Section 04 4313.16 "Adhered Stone Masonry Veneer" for disposal requirements for excess stone and stone waste.
 - 5. Section 31 1000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 ACTION SUBMITTALS

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

1.6 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report.. Include the following information:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in tons.
 - 4. Quantity of waste salvaged, both estimated and actual in tons.
 - 5. Quantity of waste recycled, both estimated and actual in tons.
 - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
 - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Qualification Data: For [waste management coordinator] [and] [refrigerant recovery technician].
- H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

- I. Refrigerant Recovery: Comply with requirements in Section 02 4119 "Selective Demolition" for refrigerant recovery submittals.

1.7 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste management coordination of projects with similar requirements. Superintendent may serve as Waste Management Coordinator.
- B. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.
- C. Waste Management Conference(s): Conduct conference(s) at Project site to comply with requirements in Section 01 3100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan including responsibilities of each contractor and waste management coordinator.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - 5. Review waste management requirements for each trade.

1.8 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work. Use. Include estimated quantities and assumptions for estimates.

PART 2 - PRODUCTS

2.1 RECYCLING RECEIVERS AND PROCESSORS

- A. Subject to compliance with requirements, available recycling receivers and processors include, but are not limited to, the following:
 - 1. **<Insert names and telephone numbers of local recycling receivers and processors of recyclable materials>.**

2.2 PERFORMANCE REQUIREMENTS

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

1. Demolition Waste:

- a. Asphalt paving.
- b. Concrete.
- c. Concrete reinforcing steel.
- d. Brick.
- e. Concrete masonry units.
- f. Wood studs.
- g. Wood joists.
- h. Plywood and oriented strand board.
- i. Wood paneling.
- j. Wood trim.
- k. Structural and miscellaneous steel.
- l. Rough hardware.
- m. Roofing.
- n. Insulation.
- o. Doors and frames.
- p. Door hardware.
- q. Windows.
- r. Glazing.
- s. Metal studs.
- t. Gypsum board.
- u. Acoustical tile and panels.
- v. Carpet.
- w. Carpet pad.
- x. Demountable partitions.
- y. Equipment.
- z. Cabinets.
- aa. Plumbing fixtures.
- bb. Piping.
- cc. Supports and hangers.
- dd. Valves.
- ee. Sprinklers.
- ff. Mechanical equipment.
- gg. Refrigerants.
- hh. Electrical conduit.
- ii. Copper wiring.
- jj. Lighting fixtures.
- kk. Lamps.
- ll. Ballasts.
- mm. Electrical devices.
- nn. Switchgear and panelboards.
- oo. Transformers.
- pp. <Insert materials required>.

2. Construction Waste:

- a. Masonry and CMU.

- b. Lumber.
- c. Wood sheet materials.
- d. Wood trim.
- e. Metals.
- f. Roofing.
- g. Insulation.
- h. Carpet and pad.
- i. Gypsum board.
- j. Piping.
- k. Electrical conduit.
- l. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Wood pallets.
 - 8) Plastic pails.
- m. Construction Office Waste: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following construction office waste materials:
 - 1) Paper.
 - 2) Aluminum cans.
 - 3) Glass containers.
- n. <Insert materials required>.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with operation, termination, and removal requirements in Section 01 5000 "Temporary Facilities and Controls."
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 - 1. Distribute waste management plan to everyone concerned within three days of submittal return.

2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
 2. Comply with Section 01 5000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Comply with requirements in Section 02 4119 "Selective Demolition" for salvaging demolition waste.
- B. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until installation.
 4. Protect items from damage during transport and storage.
 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- C. Salvaged Items for Sale and Donation: Not permitted on Project site.
- D. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
- E. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- F. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- G. Plumbing Fixtures: Separate by type and size.
- H. Lighting Fixtures: Separate lamps by type and protect from breakage.
- I. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING DEMOLITION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

3.4 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Grind asphalt to maximum 1-1/2-inch size.
 - 1. Crush asphaltic concrete paving and screen to comply with requirements in Section 31 2000 "Earth Moving" for use as general fill.
- B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
- C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
 - 1. Pulverize concrete to maximum 1-1/2-inch size.
 - 2. Crush concrete and screen to comply with requirements in Section 31 2000 "Earth Moving" for use as satisfactory soil for fill or subbase.
- D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- E. Metals: Separate metals by type.
 - 1. Structural Steel: Stack members according to size, type of member, and length.
 - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- F. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

- G. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- H. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- I. Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.
- J. Carpet Tile: Remove debris, trash, and adhesive.
 - 1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- K. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.
- L. Conduit: Reduce conduit to straight lengths and store by material and size.
- M. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
 - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
 - a. Comply with requirements in Section 32 9300 "Plants" for use of clean sawdust as organic mulch.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
 - 1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
 - a. Comply with requirements in Section 32 9300 "Plants" for use of clean ground gypsum board as inorganic soil amendment.
- D. Paint: Seal containers and store by type.

3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. General: Except for items or materials to be salvaged or recycled, remove waste materials and legally dispose of at designated spoil areas on Owner's property.
- C. Burning: Do not burn waste materials.
- D. Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

3.7 ATTACHMENTS

- A. Form CWM-1 for construction waste identification.
- B. Form CWM-2 for demolition waste identification.
- C. Form CWM-3 for construction waste reduction work plan.
- D. Form CWM-4 for demolition waste reduction work plan.
- E. Form CWM-5 for cost/revenue analysis of construction waste reduction work plan.
- F. Form CWM-6 for cost/revenue analysis of demolition waste reduction work plan.
- G. Form CWM-7 for construction waste reduction progress report.
- H. Form CWM-8 for demolition waste reduction progress report.

END OF SECTION 01 7419

SECTION 01 7700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
- B. Related Requirements:
 - 1. Section 01 3233 "Photographic Documentation" for submitting Final Completion construction photographic documentation.
 - 2. Section 01 7823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.

1.3 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.

1.4 ACTION SUBMITTALS

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

1.5 CLOSEOUT SUBMITTALS

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

1.6 MAINTENANCE MATERIAL SUBMITTALS

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

1.7 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.

- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Construction Manager. Label with manufacturer's name and model number.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Construction Manager's signature for receipt of submittals.
5. Submit testing, adjusting, and balancing records.
6. Submit sustainable design submittals not previously submitted.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 7900 "Demonstration and Training."
6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.

8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements.
 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.8 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 in accordance with Section 01 2900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
 5. Submit Final Completion photographic documentation.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS

- 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, listed by room or space number.

2. Organize items applying to each space by major element, including categories for ceilings, 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 Contractor.
 - d. Page number.
4. Submit list of incomplete items in the following format:
 - a. MS Excel Electronic File: Architect, through Construction Manager, will return annotated file.

1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 1. Submit by email to Architect.
- E. Warranties in Paper Form:
 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 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.
- F. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site 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 not planted, mulched, or 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. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
 - i. Vacuum and mop concrete.
 - j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - k. 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.
 - l. Remove labels that are not permanent.
 - m. Wipe surfaces of mechanical and electrical equipment[, **elevator equipment**,] and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

- n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - 1) Clean HVAC system in compliance with NADCA ACR. Provide written report on completion of cleaning.
 - q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
 - r. Clean strainers.
 - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 01 5000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste-disposal requirements in Section 01 7419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations required by Section 01 7300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 01 7700

SECTION 01 7823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory manuals.
 - 2. Emergency manuals.
 - 3. Systems and equipment operation manuals.
 - 4. Systems and equipment maintenance manuals.
 - 5. Product maintenance manuals.
- B. Related Requirements:
 - 1. Section 01 1200 "Multiple Contract Summary" for coordinating operation and maintenance manuals covering the Work of multiple contracts.
 - 2. Section 01 3300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 - 3. Section 01 9113 "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.

1.3 DEFINITIONS

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

1.4 CLOSEOUT SUBMITTALS

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

1. Submit on digital media acceptable to Architect. Enable reviewer comments on draft submittals.
 2. Submit three paper copies. Architect, through Construction Manager, will return two copies.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.
- E. Comply with Section 01 7700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components

- of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
 4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.6 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 Owner.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for Construction Manager.
 7. Name and contact information for Architect.
 8. Name and contact information for Commissioning Authority.
 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to

ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
 2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
 3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. 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. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- 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.

1.9 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.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- 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.

1.10 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.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- 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. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. 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.
- E. 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.

- F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- G. 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.
- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- I. 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.
- J. 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 maintenance manuals.

1.11 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.

2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 7823

SECTION 01 7839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Requirements:
 - 1. Section 01 1200 "Multiple Contract Summary" for coordinating Project Record Documents covering the Work of multiple contracts.
 - 2. Section 01 7300 "Execution" for final property survey.
 - 3. Section 01 7700 "Closeout Procedures" for general closeout procedures.
 - 4. Section 01 7823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set(s) of marked-up record prints.
 - 2. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit PDF electronic files of scanned record prints and one set(s) of file prints.
 - 2) Submit Record Digital Data Files and one set(s) of plots.
 - 3) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit PDF electronic files of scanned Record Prints and one set(s) of file prints.
 - 2) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.

- C. Record Product Data: Submit [annotated PDF electronic files and directories] [and] <Insert number> [paper copies] of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report weekly indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.4 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings 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 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 Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 - 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 - 4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect and Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Annotated PDF electronic file with comment function enabled.
 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 3. Refer instances of uncertainty to Architect through Construction Manager for resolution.
 4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Section 01 3100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
 - b. Architect will provide data file layer information. Record markups in separate layers.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect and Construction Manager.
 - e. Name of Contractor.

1.5 RECORD SPECIFICATIONS

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

- B. Format: Submit record specifications as [annotated PDF electronic file] [paper copy] [scanned PDF electronic file(s) of marked-up paper copy of Specifications].

1.6 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.
- C. Format: Submit Record Product Data as annotated PDF electronic file.
 - 1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

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

1.8 MAINTENANCE OF RECORD DOCUMENTS

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 7839

SECTION 02 4119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

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

- B. Related Requirements:
 - 1. Section 01 1000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
 - 2. Section 01 5639 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
 - 3. Section 01 7300 "Execution" for cutting and patching procedures.
 - 4. Section 01 3516 "Alteration Project Procedures" for general protection and work procedures for alteration projects.
 - 5. Section 31 1000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.2 DEFINITIONS

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

- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

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

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

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

1.3 MATERIALS OWNERSHIP

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

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

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

1.4 PREINSTALLATION MEETINGS

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

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Engineering Survey: Submit engineering survey of condition of building.
- C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- D. Schedule of Selective Demolition Activities: Indicate the following:
 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's and other tenants' on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Use of elevator and stairs.
 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- E. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations. Comply with Section 01 3233 "Photographic Documentation." Submit before Work begins.
- F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- G. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6 CLOSEOUT SUBMITTALS

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

1.7 QUALITY ASSURANCE

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

1.8 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
1. Before selective demolition, Owner will remove the following items:
- a. **<Insert items to be removed by Owner>**.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. Hazardous materials will be removed by Owner before start of the Work.
2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.
- F. Storage or sale of removed items or materials on-site is not permitted.
- G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 COORDINATION

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
 - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
- D. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.
- E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
 - 1. Inventory and record the condition of items to be removed and salvaged.
 - 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

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

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

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

- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 2. Arrange to shut off utilities with utility companies.
 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 5000 "Temporary Facilities and Controls."
- B. Temporary Shoring: 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.
1. Strengthen or add new supports when required during progress of selective demolition.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 5. Maintain fire watch during and for at least 2 hours after flame-cutting operations.
 6. Maintain adequate ventilation when using cutting torches.
 7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 10. Dispose of demolished items and materials promptly. Comply with requirements in Section 01 7419 "Construction Waste Management and Disposal."
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Work in Historic Areas: Selective demolition may be performed only in areas of Project that are not designated as historic. In historic spaces, areas, and rooms, or on historic surfaces, the terms "demolish" or "remove" shall mean historic "removal" or "dismantling" as specified in Section 02 4296 "Historic Removal and Dismantling."
- D. Removed and Salvaged Items:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
- E. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

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

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site [and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.] [and recycle or dispose of them according to Section 01 7419 "Construction Waste Management and Disposal."]
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 4. Comply with requirements specified in Section 01 7419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.

3.8 CLEANING

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

END OF SECTION 02 4119

SECTION 031000
CONCRETE FORMWORK

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Includes: Provision of formwork for cast-in-place concrete and installation of embedded items.

1.2 REFERENCES

- A. Requirements of GENERAL CONDITIONS and DIVISION NO. 1 apply to all Work in this Section.
- B. Published specification, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work of this Section where cited by abbreviations noted below (latest editions apply).
1. California Code of Regulations. Title 24, 2019 edition, also known as California Building Code (CBC).
 2. American Society for Testing and Materials (ASTM).
 3. Federal Specifications (FS).
 4. American Concrete Institute's "Recommended Practice for Concrete Formwork," (ACI 347).
 5. United States Voluntary Product Standard for Construction and Industrial Plywood (PS 1).
 6. American Plywood Association's "Guide to Plywood Grades" (APA).
 7. West Coast Lumber Inspection Bureau's "Standard Grading Rules No. 17" (WCLIB).

1.3 QUALITY ASSURANCE

- A. Design Criteria: Formwork shall conform to ACI 347 and ACI 318 section 26.11.
1. Formwork:
 - a. Shall prevent leakage or washing out of cement mortar.
 - b. Shall resist spread, shifting, and settling.
 - c. Shall reproduce accurately required lines, grades, and surfaces within tolerances specified.

2. Safety: The Contractor shall be responsible for adequate strength and safety of all formwork including false work and shoring.

B. Allowable Tolerances: Formwork shall produce concrete within tolerance limits recommended in ACI 347, unless otherwise noted.

1.4 SUBMITTALS

A. Samples: Only as requested by the Architect.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.

1.6 JOB CONDITIONS

A. Sequencing Schedule:

1. Ensure timely delivery of embedded items. Be responsible for cutting and patching necessitated by failure to place embedded items.
2. Plan erection and removal to permit proper sequence of concrete placing without damage to concrete.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forming Materials:

1. Panel or board forms at the Contractor's option.
 - a. Panel Forms: Minimum 5/8-inch thick exterior grade plywood with sealed edges, PS 1 grade Ply form Class I and II B-B Exterior or HDO Exterior.
 - b. Board Forms: Shiplap or tongue and groove lined with PS 1 grade Ply form Class I and II Exterior 1/2-inch or HDO Exterior 1/2-inch or 3/16-inch thick fiberboard conforming to FS LLL-B-810a (1), type I.
2. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on Drawings.
 - a. Use Plywood complying with U.S. Product Standard PS-1 "B-B

(Concrete Form) Plywood", Class I, Exterior Grade or better, with each piece bearing legible inspection trademark. Panels to receive specified form sealer to ensure uniform finish of exposed surfaces.

- b. Designated "Architectural Concrete" Surfaces: Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form", Class 1.
 3. Chamfer Strips: Burke Concrete Accessories' PVC type CSF ½-inch, all exposed corners.
 4. Columns Forms: SONOTUBE or equal, and as required for other configurations.
- B. Wood Framing: WCLIB standard grade or better Douglas fir.
- C. Form Ties and Spreaders: Metal type acting as spreaders, leaving no metal within one inch of concrete face and no fractures, spalls, depressions or other surface disfigurements greater than 3/4-inch in diameter.
- D. Expansion Joint Filler:
1. Fiber Type: Premolded asphalt-impregnated fiber, ASTM D1751, 1/4-inch thick unless otherwise noted. Same as W. R. Meadows, Inc.'s "Sealtight Fiber Expansion Joint"; Grace Construction Materials "Serviced Fiber Expansion Joint Filler, Code 1390"; National Expansion Joint Co.'s "Fiber Joint Filler No. 12"; Burke Concrete Accessories, Inc.'s "Burke Fiber Expansion Joint"; or equal product substituted per Section 01 25 00.
 2. Cork Type: Preformed cork, ASTM D1752, Type II, 1/4-inch size unless otherwise noted. Same as W. R. Meadows, Inc.'s "Sealtight Cork Expansion Joint"; Sonneborn-Contech's "Sonoflex Cork"; Grace Construction Materials' "Serviced Standard Cork Expansion Joint Filler, Code 4323; or equal product substituted per Section 01 25 00.
- E. Form Sealer: Same as Grace Construction Material's "Formfilm"; or equal product substituted per Section 01 25 00.
- F. Release Agent: Must not stain or otherwise adversely affect architectural concrete surfaces. Same as The Nox-Crete Co.'s "Nox-Crete Form Coating"; Industrial Synthetics Corp.'s "Synthex;" or equal product substituted per Section 01 25 00.
- G. Foam Board: Extruded close cell polystyrene foam, channeled for drainage, with a minimum compressive strength of 60 psi at 0.1-inch deformation when tested in accordance with ASTM D1621, and meeting requirements of FS-HH-I-524b, Type II, Class B. Same as The Dow Chemical Co.'s "Styroform PD Brand" or equal product substituted per Section 01 25 00.

2.2 SOURCE QUALITY CONTROL

- A. Plywood shall bear APA grade-trademark.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where formwork will be constructed and verify that:
 - 1. Excavations are sufficient to permit placement, inspection and removal of forms.
 - 2. Excavations for earth forms have been neatly and accurately cut.
 - 3. Conditions are otherwise proper for formwork construction.
- B. Do not start work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Obtain necessary information for coordination of formwork with items to be embedded in concrete and other related work.

3.3 CONSTRUCTION

- A. General:
 - 1. Design, erect, support, brace and maintain formwork to support vertical and lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position. Maintain formwork construction tolerances complying with ACI 347.
 - 2. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb Work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in Work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
 - 3. Frame openings where indicated on Architectural, Structural, Mechanical, Plumbing and Electrical drawings.
- B. Earth Forms:
 - 1. Construct wood edge strips at top sides of excavations.
 - 2. Provide forms for footings wherever concrete cannot be placed against solid earth excavation.

3. Remove loose dirt and debris prior to concrete pours.
4. Foundation concrete may be placed directly into neat excavations provided the foundation trench walls are stable as determined by the Architect (Structural Engineer), subject to the approval of DSA. In such case, minimum formwork shown on the drawings is mandatory to insure clean excavations immediately prior to and during the placing of concrete.

C. Walls and Other Formed Elements:

1. Erect outside forms for exposed exterior walls first and obtain the Architect's approval before reinforcement is placed. Obtain Architect's approval of the reinforcement before interior form is erected.
2. Carefully align inside and outside forms before tightening ties.
3. Plywood Forms: Insure vertical joints are plumb and horizontal joints are level; arrange joints and ties in geometrical pattern as approved by the Architect.
4. Form inside corners at exposed conditions with mitered boards or plywood so that no concrete is placed against form ends.
5. After erection, seal all cracks, holes, slits, gaps, and apertures in forms so that they will withstand the pressure and will remain completely watertight.
6. Provide a means to seal the bottom of forms at construction joints such as foam tape or other gasket devices.
7. Apply a coating of release agent prior to the erection of formwork. Follow approved manufacturer's recommendations.

D. Slab Forms:

1. Establish levels and set screeds.
2. Depress slabs where required to receive special floor finishes.

E. Beam or Joist Forms:

1. Provide cambers as noted on Contract Drawings.

F. Cleanouts and Openings: Provide on interior face of wall forms as required for effective removal of loose dirt, debris and waste material, for inspection of reinforcing and for introduction of vibrators where the Architect deems necessary.

G. Expansion Joints:

1. Provide in exterior concrete paving on grade at maximum 24-feet on

center or as noted and at intersections with vertical surfaces, curbs, manholes or other penetrations through paving.

2. Use fiber type expansion joint fillers typically and depress 1/4-inch unless otherwise noted.
3. Use cork type expansion joint fillers at conditions with non-bituminous waterproofing, liquid waterproofing or sealant systems.

H. Construction Joints:

1. Provide where shown on the drawings as directed by the Architect and per CBC requirements
2. Provide key indentations at all joints.
3. Provide pour strips on inside face of forms at horizontal joints but remove strips and thoroughly clean out reglets before placing subsequent portions of wall.
4. Prevent formations of shoulders and ledges.
5. Provide means for drawing forms into firm contact with concrete before placing additional concrete over previous pours where shrinking and warping has separated concrete from forms.

I. Embedded Items:

1. Properly locate, unless locating is specified elsewhere, and place inserts and embedded items required by other trades prior to casting concrete.

J. Shoring and underpinning:

1. Adequately brace and maintain shoring to safely support vertical, lateral, and asymmetrical loads until completed structure has attained design strength or 14 days, whichever is greater.
2. Distribute shoring loads over area where shoring is erected and protect against undermining or settlement.
3. Provide means for making vertical adjustments to compensate for settlement either before or during placing of concrete.
4. Construct shores for soffits of beams to permit removal of forms without removing shores.
5. Re-shoring will be permitted. Shores and re-shores shall be designed by a structural Engineer registered in the State of California and installed under his/her direction. The structural Engineer shall be employed by the Contractor.

3.4 REMOVAL

- A. Secure the Architect's approval for time and sequence of form removal.
- B. Form Removal: Forms shall be removed without damage to the concrete, and in no case shall they be removed prior to the concrete member attaining the specified strength.

*Estimated curing time required to obtain desired strength. Results of the 7-day test cylinder break shall be presented to the Architect to demonstrate compliance with above specified strength requirements prior to form removal. If a 7-day test cylinder break demonstrates strength that is less than that specified, the Contractor may elect to take additional cylinders at the time of next pour to demonstrate strength requirements. The Contractor shall bear the cost of taking and testing the additional samples.

- C. Forms:
 - 1. Remove forms carefully to avoid damaging corners and edges of exposed concrete.
 - 2. Reuse:
 - a. The Architect will approve reuse of forms provided they are straight, clean, free from nails, dirt, hardened concrete, or other injurious matter and edges and surfaces are in good condition.
 - b. Clean and repair any damage caused by placing, removal, or storage. Reuse of formwork with repairs or patches which would result in adverse effects to architectural concrete finish will not be permitted.
 - c. Store formwork in manner to prevent damage or distortion.
 - d. Reseal as required to achieve concrete of specified quality.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCEMENT

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Section Includes: Provision of reinforcement for all concrete unless specifically noted otherwise.
- B. Related Section:
 - 1. Section 03 60 00 - Concrete Test and Inspection

1.2 REFERENCES

- A. Requirements of the GENERAL CONDITIONS and DIVISION NO. 1 apply to all Work in this Section.
- B. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work of this Section where cited by abbreviations noted below (latest editions apply).
 - 1. California Code of Regulations. Title 24, 2019 edition, also known as California Building Code (CBC).
 - 2. American Society for Testing and Materials (ASTM).
 - 3. American Concrete Institute's:
 - a. "Manual of Standard Practice for Detailing Reinforced Concrete Structures" (ACI 315).
 - b. "Building Code Requirements for Reinforced Concrete" (ACI 318-14).
 - 4. Concrete Reinforcing Steel Institute (CRSI):
 - a. "Manual of Standard Practice."
 - b. "Recommended Practice for Placing Reinforcing Bars."
 - 5. American Welding Society's:
 - a. "Mild Steel Covered Arc-Welding Electrodes": (AWS A5.1).

- b. "Reinforcing Steel Welding Code: (AWS D1.4).

1.3 QUALITY ASSURANCE

- A. Welders' Qualifications: Welders shall be qualified in accordance with AWS D1.4.
- B. Reinforcing steel shall not be permitted to rust where there is danger of staining exposed surfaces of adjacent concrete. The Contractor shall replace rust-stained concrete at his expense.
- C. Allowable Tolerances: Reinforcing steel shall be placed within tolerances permitted by CBC, and ACI 318 unless otherwise approved by the Architect.
- D. The Owner's Testing Agency will provide tests in accordance with CBC requirements.
1. Collect mill test reports for reinforcement.
 2. Take samples from bundles at fabricators.
 - a. When bundles are identified by heat number and accompanied by mill analysis, two specimens shall be taken from each ten (10) tons, or fraction thereof, of each size and grade.
 - b. When reinforcement is not positively identified by heat numbers or when random sampling is intended, two specimens shall be taken from each 2½ tons, or fraction thereof, of each size and grade.
 3. Test for tensile and bending strengths.
 4. Provide inspection of welding, including prior fit-up, welding equipment, weld quality and welder certification in accordance with AWS D1.4. Chemical analysis sufficient to determine carbon equivalent and minimum preheat temperature shall be performed when reinforcement does not conform to low-alloy steel requirements of CBC Section 1903A.8.

1.4 SUBMITTALS

- A. Shop Drawings: Show bending and placing details, size and location of reinforcing steel. Include diagrammatic wall elevations at 1/4-inch equals one-foot scale to clearly show position and erection marks of bars including marginal bars around openings with dowels, splices, etc.
- B. Certified mill test reports (tensile and bending) for each heat or melt of steel prior to delivery of material to the job site. Where reinforcing is to be welded, mill test reports shall verify the weldability of the steel.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver reinforcement and accessories to site not more than 48-hours before placement.
- B. Store in manner to prevent excessive rusting and fouling with grease, dirt, or other bond-weakening coatings.
- C. Take precautions to maintain identification after bundles are broken.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Bars: New billet steel, ASTM A615 Grade 60, ASTM A706, or ASTM A615, Grade 60, designation S1.
- B. Tie Wires and Spirals: ASTM A82.
- C. Welded Wire Fabric: ASTM A185.
- D. Welding Electrodes: Mild steel covered arc-welding types conforming to AWS A5.1.
- E. Bar Supports: As required for assembling and supporting reinforcement in place.
 - 1. Typical: CRSI Class B pre-galvanized.
 - 2. Interior and Exterior Soffits and Other Exposed Conditions: CRSI Class C plastic-protected; or class E stainless steel wire, Type 430, and containing not less than 16-percent chromium.
- F. Threaded coupler: Lenton Standard coupler by ERICO or equal product substituted per Section 01 25 00. Coupler shall develop 125-percent of specified yield strength reinforcement.

2.2 FABRICATION

- A. Shop-fabricate to comply with drawings.
- B. Conform to requirements of ACI 315 where specific details are not shown or where drawings and specifications are not more demanding.

PART 3 - EXECUTION

3.1 PLACEMENT

A. General:

1. Place bars as noted.
2. All reinforcement shall be continuous. See drawings for lap splice schedule. Stagger splices where possible. Contact lap splices shall be securely wired together to maintain alignment.
3. Ensure placement will permit concrete protection in conformance with CRSI or to extent shown.
4. Support and fasten bars securely with spacers, chairs or ties to permit their being walked upon without displacement or movement both before and during placement of concrete. Wire-tie bar intersections.
5. Do not bend bars around openings or sleeves. Wherever conduits, piping, inserts, sleeves, etc. interfere with placing of reinforcement, obtain the Architect's approval of placing before concreting.
6. Do not field bend bars unless expressly noted in the Contract Documents.

B. Reinforcement for Shotcrete Applications:

1. Place reinforcement in accordance with CBC requirements.

C. Welding:

1. Employ shielded metal-arc method and conform to AWS D1.4.
2. Ensure equipment supplies proper current and voltage and is adjustable to suit arrangement and thickness of items welded.

D. Prior to placing concrete, verify reinforcement has been bent, positioned, and secured in accordance with drawings; ensure removal of oil, grease, dirt, or other bond-weakening coatings; replace severely rust-pitted reinforcing bars.

E. Quality Assurance:

1. The Project Inspector will inspect placement of reinforcement and notify Structural Engineer of any discrepancies in placement.
2. The Owner's Testing Agency will inspect shop and field welding of reinforcing bars in accordance with CBC requirements.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Section Includes: Provision of cast-in-place concrete unless specifically noted otherwise.
- B. Related Sections:
 - 1. Section 03 60 00 - Concrete Test and Inspection

1.2 REFERENCES

- A. Requirements of GENERAL CONDITIONS and DIVISION NO. 1 apply to all Work in this Section.
- B. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work of this Section where cited by abbreviations noted below (latest editions apply).
 - 1. California Code of Regulations. 2019 edition, also known as California Building Code (CBC).
 - 2. American Society for Testing and Materials (ASTM).
 - 3. American Concrete Institute's:
 - a. "Specification for Structural Concrete for Buildings" (ACI 301).
 - b. "Recommended Practice for Cold Weather Concreting"(ACI 306).
 - c. "Recommended Practice for Hot Weather Concreting"(ACI 305).
 - d. "Recommended Practice for Measuring, Mixing and Placing Concrete" (ACI 304).
 - e. "Building Code Requirements for Reinforced Concrete" (ACI 318-14).
 - 4. State of California, Business and Transportation Agency Division of Highways' "Materials Manual," (CMM).

- A. The Contractor's Testing Laboratory Qualifications: The Contractor's Testing Laboratory shall be under direction of a Civil Engineer registered in the State of California, shall have operated successfully for four years prior to this work, and shall conform to requirements of ASTM E329.
- B. Requirements of ACI 301 shall govern work, materials and equipment related to this Section; specifications herein set minimum results required, and references to procedures are intended to establish minimal guides.
- C. The Contractor shall be responsible for quality of concrete in place and shall bear burden of proof that concrete meets minimum requirements.
- D. Placing of concrete by means of pumping will be an acceptable method of placement providing that the Contractor can demonstrate that:
 - 1. Specified concrete strengths will be met.
 - 2. Equipment has a record of satisfactory performance under similar conditions and using a similar mix.
 - 3. Trial batches have been made.

1.4 SUBMITTALS

- A. The Contractor's Testing Laboratory's certificate of compliance.
- B. The Contractor shall submit:
 - 1. Certified copies of mix designs for each concrete class specified including compressive strength test reports.
 - 2. Certification that materials meet requirements specified.
 - 3. Samples only as requested by the Architect.
 - 4. Certification from vendor that samples originate from and are representative of each lot proposed for use.
- C. The Owner's Testing Agency will submit reports on tests and inspections performed to the Owner, the Architect, the Contractor, and the Division of the State Architect.
- D. Shop Drawings: Show construction joint locations and details.
- E. Schedule of placing for the Architect's review before starting Work.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Ensure storage facilities are weather tight and dry.
- B. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.
- C. Store bulk cement in bins capable of preventing exposure to moisture.
- D. Use sacked cement in chronological order of delivery. Store each shipment so that it may be readily distinguishable from other shipments.

PART 2 - PRODUCTS

2.1 CONCRETE CLASSES

CLASS	STRENGTH	AGGREGATE	WEIGHT	SLUMP	W/C
					(By Weight)
A	3000	3/4	145	4	0.45
C	3000	1/2	145	6	0.50

- A. Class:
 - 1. Use Class "A" concrete for columns, walls, slabs and beams above grade, footing, stair treads and all other areas unless noted otherwise.
 - 3. Use Class "C" for drilled piers.
- B. Strength: Compressive strength in psi after 28-days when tested in accordance with ASTM C39. All concrete shall develop compression strength specified in 28-days. To meet above requirements, mix shall be designed such that average compressive strength will exceed specified 28-day strength by an amount as specified by ACI 318.
- C. Aggregate: Maximum size in inches.
- D. Weight: Pounds per cubic foot, air dry.
- E. Slump: In inches when tested in accordance with ASTM C143.
- F. W/C: Water-cement ratio.

2.2 MATERIALS

- A. General Requirements:

1. Cement and aggregates shall have proven history of successful use with one another. Sources of cement and aggregate shall remain unchanged throughout work unless the Architect approves request for change made at least 10-days prior to anticipated date of casting.
 2. Ready-mixed concrete shall meet requirements of ASTM C94.
 3. Deviations in properties of materials tested by the Owner's Testing Agency shall be cause for their rejection pending additional test results and redesign of mix by the Contractor's Testing Laboratory.
 4. No frozen aggregates will be permitted.
- B. Cements:
1. ASTM C150, Type II. Use one brand of cement throughout project unless otherwise acceptable to Architect.
- C. Fly Ash: ASTM C618, Type F, max. of 15%.
- D. Aggregates:
1. Coarse: ASTM C33. Coarse aggregate shall consist of a clean, hard, fine grained, sound crushed rock, or washed gravel or a combination of both. It shall be free from oil, organic matter or other deleterious substances and shall not contain more than two percent by weight of shale or cherty material. "Cleanness value shall not be less than 75 when tested per MM Test Method, 227 and conforming to CBC Section 1903A.6.
 2. Fines: ASTM C33. Sand equivalent shall be not less than 75 when tested as per ASTM D2419.
 3. Light weight aggregate C330.
 4. Provide aggregates from a single source for exposed concrete.
- E. Water: Clean and potable, free from impurities detrimental to concrete.
- F. Water-Reducing Admixture: ASTM C494, Type A, non-lignini sulfonate. Same as Grace Construction Materials' "WRDA with Hycol"; Master Builders "Pozzolith 322N"; Sika Corp.'s "Plastocrete 161"; or equal product substituted per Section 01 25 00.
1. Air Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other products. Same as W.R. Grace's "Daravair", Master Builders' "Micro-Air", Sika Corp.'s "Sika Aer", or equal product substituted per Section 01 25 00.

2. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C494, Type F or Type G. Same as W.R. Grace's "WRDA 19", Master Builders' "Rheobuild", Sika Corp.'s "Sikament", or equal product substituted per Section 01 25 00.
 3. Water Reducing, Accelerator Admixture: ASTM C494, Type E. Same as W.R. Grace's "Daraset", Master Builder's "Pozzutec 20", Euclid's "Accelgurad 80", or equal product substituted per Section 01 25 00.
 4. Water Reducing, Retarding Admixture: ASTM C494, Type D. Same as W.R. Grace's "Daratard-17", Master Builders' "Pozzoliith R", Sika's "Plastiment", or equal product substituted per Section 01 25 00.
 5. Fibrous Reinforcement: Engineered polypropylene fibers designed for secondary reinforcement of concrete slabs. Same as W.R. Grace's "Grace Fibers", Euclid's "Fiberstrand 100", Fibermesh's "Fibermesh", or equal product substituted per Section 01 25 00.
- G. Other Admixtures: Only as approved by the Architect.
- H. Wax Sealer: Heavy penetrating type as manufactured by approved manufacturer of clear hardener.
- I. Abrasive Grains: Aluminum oxide type. Same as Sonneborn-Contech's "FRICTEX NS"; General Abrasive Co., Inc.'s "Fut-Sure"; The Exolon Co.'s "Exolon Anti-Slip"; or equal product substituted per Section 01 25 00.
- J. Non-Shrink Grout: Premixed high strength grout requiring only addition of water at the site. Same as Master Builder's "Masterflow 928 Grout"; Burke's "Non-Ferrous, Non-Shrink Grout", or equal product substituted per Section 012500.
- K. Curing Materials:
1. Waterproof Paper: ASTM C171, Type 1, regular. Same as Sisalkraft Division of St. Regis Paper Co.'s "Orange Label"; or equal product substituted per Section 01 25 00.
 2. Sheet Plastic: Polyethylene, four mils thick, fungus-resistant.
 3. Curing Compound: ASTM C309. Same as Grace Construction Materials' "Horn Clear Seal"; Grimes Co.'s "Sealcrete"; Master Builders' "Masterseal W", or equal product substituted per Section 01 25 00.
- L. Concrete Sealer: Clear water repellent treatment, blend of six resins containing no silicones or stearates, no darkening or change of color. Same as Sonneborn-Contech's "White Rox M-6-50-8"; Tamms Industries' "Chemstop" or equal product substituted per Section 01630.

- M. Hardener, Clear Liquid Type: Grace construction Materials' "Hornstone Crystal Chemical Hardener"; Master Builder's "Mastercron"; Sonneborn-Contech's "Lapidolith"; Upco Co.'s "Vitrox 4701"; or equal product substituted per Section 01 25 00.
- N. Epoxy Adhesive: Two component materials suitable for anchoring rebar into dry or damp concrete. Same as Hilti HIT-RE 500-SD (ICC ESR-2322) or equal product substituted per Section 01 25 00.

2.3 MIXES

A. General Requirements:

1. The Contractor shall perform tests or assemble the necessary data indicating conformance with specifications.
2. For each mix submit data showing that proposed mix will attain the required strength in accordance with requirements of ACI 318.
3. The Contractor shall instruct Laboratory to base mix design on use of materials tested and approved by the Owner's Testing Agency.
4. Mix shall be designed, tested, and adjusted if necessary in ample time before first concrete is scheduled to be placed. Laboratory data and strength test results for revised mix design shall be submitted to Architect prior to using in project.
5. Insure mix designs will produce concrete to strengths specified and of uniform density without segregation.
6. If mix yield exceeds 1-cubic yard, modify mix design to no more than one cubic yard without changing cement content.
7. The Contractor's mix designs shall be subject to review by the Architect and by the Owner's Testing Agency.
8. Introduction of calcium chloride will not be permitted.
9. Unspecified admixtures will not be permitted unless the Architect reviews, the Contractor modifies mix designs as necessary, and modifications are accepted by the Owner's Testing Agency.

B. Slab-on-Grade Mix requirements

1. Maximum water/cement ratio of 0.45.
2. Maximum fly ash content of 15% (as percentage replacement of cement).

3. Do not use air entrainment additives.
 4. Use of Water-Reducing admixture is required. High Range Water-Reducing admixture (super plasticizer) shall be used when required to maintain workability and pumpability.
- C. Patching Mortar: Mix in proportions by volume of one part cement to two parts fine sand.
- D. Concrete Fill at Stairs: Mix in proportions by volume of one part cement, two parts fine aggregate, one part coarse aggregate (3/8- inch); with as little water as necessary to make stiff workable plastic mix.
- E. Non-Shrink Grout: Follow approved manufacturer's printed instructions and recommendations.

2.4 MIXING

A. Batching Plant Conditions:

1. Ensure equipment and plant will afford accurate weighing, minimize segregation and will efficiently handle all materials to satisfaction of the Architect and the Owner's Testing Agency.
2. Replace at no additional expense equipment the Architect and the Owner's Testing Agency deem inadequate or unsuitable.
3. Use approved moisture meter capable of determining moisture content of sand.

B. General Requirements:

1. Thoroughly clean concrete equipment before use for architectural concrete mixes to avoid contamination.
2. Mix cement, fine and coarse aggregates, admixtures and water to exact proportions of mix designs. Method of mixing shall comply with ACI 318.
3. Measure fine and coarse aggregates separately according to approved method which provides accurate control and easy checking.
4. Adjust grading to improve workability; do not add water unless otherwise directed.
5. Maintain proportions, values, or factors of approved mixes throughout work.

6. Mix concrete in transit mixers five minutes immediately prior to discharge in addition to mixing as called for by ACI 304 and ASTM C94.

C. Admixtures: Use automatic metering dispenser to introduce admixture into mix. Dispenser shall be recommended and calibrated by admixture manufacturer.

2.5 SOURCE QUALITY CONTROL

A. The Owner's Testing Agency will:

1. Review mix designs, certificates of compliance, and samples of materials the Contractor proposes to use.
2. Test and inspect materials, as necessary, in accordance with ACI 318 and CBC Sections 1903A for compliance with requirements.
3. Take samples as required from the Contractor's designated sources.
4. Take one grab sample for each 100 tons of Portland cement except that, when used in bulk loading ready-mix plants where separate bins for pretested cement are not available, take grab samples for each shipment of cement placed in bin with not less than one sample being taken for each day's pour and subsequently test such samples if required by the Architect who may be so advised by Division of the State Architect.
5. Test both coarse and fine aggregate by use of solution of sodium or magnesium sulfate, or both whenever in the judgement of the Architect such tests are necessary to determine quality of material. Perform such tests in accordance with ASTM C88. Loss shall not exceed 6-percent of either fine or coarse aggregate. Aggregate failing to comply with this requirement may be used in the Work provided it contains less than 2- percent of shale and other deleterious particles and shows a loss in soundness test of not more than 10-percent when tested in the sodium sulphate solution. Test aggregates as required by ACI 318.
6. Test for sand equivalent of fine aggregate in accordance with California Test 217.
7. Test for cleanness value of coarse aggregate in accordance with California Test 227.
8. Inspect plant prior to any work to verify following:
 - a. Plant is equipped with approved metering devices for determining moisture content of fine aggregate.
 - b. Other plant quality controls are adequate.

9. Continuously inspect quality and quantity of materials used in transit mixed concrete, in batched aggregates and ready-mixed concrete at mixing plant or other location per CBC requirements where other materials are measured.

B. Waiver of Batch Plant Inspection:

1. Continuous batch plant inspection may be waived in accordance with CBC requirements if the plant complies with ASTM C94 and has been certified by an agency acceptable to DSA to comply with the requirements of the National Ready Mix Concrete Association.
2. When batch plant inspection is waived, the following requirements shall apply:
 - a. Testing Agency shall check the first batching at the start of work and furnish mix proportions to the licensed Weighmaster.
 - b. Licensed Weighmaster shall identify material quantities and certify each load by a ticket.
 - c. Project Inspector shall collect truck mix tickets with load identification and maintain a daily record of placement. Trucks without a load ticket identifying the mix shall be rejected. Copies of daily placement record shall be submitted to DSA.
 - d. At the end of the project, the Weighmaster shall submit an affidavit to DSA certifying that all concrete supplied conforms to proportions established by mix designs.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine units of work to be cast and verify that:**
1. Construction of formwork is complete.
 2. Required reinforcement, inserts, and embedded items are in place.
 3. Form ties at construction joints are tight.
 4. Concrete-receiving places are free of debris.
 5. Dampen subgrade or sand course for slabs-on-grade. Do not saturate.
 6. Depths of depressed slab conditions are correct for delayed finish noted and for its proper bonding to concrete.

7. Conveying equipment is clean and properly operating.
 8. The Architect has reviewed formwork and reinforcing steel and that preparations have been checked with the Project Inspector.
- B. Do not begin casting before unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Ensure availability of sufficient labor, equipment and materials to place concrete correctly in accordance with scheduled casting.
- B. Protect finished surfaces adjacent to concrete-receiving places.
- C. Clean transportation and handling equipment at frequent intervals and flush thoroughly with water before each day's run. Do not discharge wash water into concrete form.
- D. Construction Joints: Clean and roughen all construction joint contact surfaces by removing all surface laitance and exposing sound mortar. Sandblasting and bush-hammering are acceptable methods.

3.3 PLACING

- A. The Inspector of Record, Architect, Structural Engineer, Testing Laboratory and DSA shall be notified at least 48 hours before placing concrete.
- B. Place concrete in accordance with CBC Section 1905A.
- C. Place concrete in cycles as a continuous operation to permit proper and thorough integration and to complete scheduled placement. Place no concrete where sun, wind, heat, or facilities prevent proper finishing and curing.
- D. Convey concrete as rapidly and directly as practicable to preserve quality and to prevent separation from rehandling and flowing; do not deposit concrete initially set. Cast concrete within ninety (90) minutes after adding water unless otherwise noted. Retempering of concrete which has partially set will not be permitted.
- E. Take precautions to avoid damage to under-slab moisture barrier and displacement of reinforcement and formwork.
- F. Deposit concrete vertically in its final position. Avoid free falls in excess of six feet where reinforcement will cause segregation and in typical conditions unless the Architect approves otherwise.
- G. Keep forms and reinforcement clean above pour line by removing clinging concrete with wire brush before casting next lift. Also remove leakage through

forms.

- H. Interruption in casting longer than 60-minutes shall be cause for discontinuing casting for remainder of day. In this event, cut back concrete and provide construction joints as the Architect directs; clean forms and reinforcement as necessary to receive concrete at a later time.
- I. Hot Weather Concreting: Conform to ACI 305 and following requirements when mean daily temperature rises above 75 degrees Fahrenheit.
 - 1. An upper temperature limit of concrete mixes shall be established by the Contractor for each class of concrete. Concrete temperature during placing shall not be so high as to cause difficulty from loss of slump, flash set, or cold joints, and shall not exceed 90°F. Other project climatic conditions detrimental to concrete quality such as relative humidity, wind velocity, and solar radiation shall also be considered.
 - 2. Trial batches of concrete for each mix design shall be made at the limiting mix temperature selected. In lieu of trial batches, compression strength test reports (20 minimum) at the limiting temperature for each proposed mix shall be submitted to the Owner's testing laboratory for review.
 - 3. Practices to maintain concrete below maximum limiting temperature shall be in accordance with ACI 305. Concrete ingredients may be cooled before mixing, or flake ice or well-crushed ice of a size that will melt completely during mixing may be substituted for part of the mixing water.
 - 4. Practices to avoid the potential problems of hot weather concreting shall be employed by the Contractor in accordance with ACI 305.
 - 5. When the temperature of the reinforcing steel or steel deck forms is greater than 120°F, reinforcing and forms shall be sprayed with water just prior to placing the concrete.
- J. Cold Weather Concreting:
 - 1. No placement of concrete will be allowed at temperatures below 20 degrees Fahrenheit or if mean daily temperature for curing period is anticipated to be below 20 degrees Fahrenheit.
 - 2. No concrete placement will be allowed on frozen subgrade.
 - 3. Conform to ACI 306 and following requirements when mean daily temperature falls below 40 degrees Fahrenheit.
 - a. Reinforcement, forms or ground to receive concrete shall be completely free from frost.

- b. Concrete at time of placement for footings shall have temperature no lower than 50 degrees Fahrenheit, for all other concrete this minimum temperature at time of placement shall be 60 degrees Fahrenheit. Maximum temperature shall be 90 degrees Fahrenheit.
- c. Concrete shall be maintained at temperature no lower than 50 degrees Fahrenheit for minimum 7-day period after placement by means of blanket insulation, heaters, or other methods as approved by the Architect.
- d. Use of calcium chloride or admixtures containing calcium chloride as accelerators will not be permitted.
- e. The Contractor shall keep a record of concrete surface temperature for first 7-days after each pour. This record shall be open to inspection by the Architect.

K. Consolidating:

- 1. Use vibrators for thorough consolidation of concrete.
- 2. Provide vibrators for each location during simultaneous placing to ensure timely consolidation around reinforcement, embedded items and into corners of forms; ensure availability of spare vibrators in case of failures. Vibrate through full depth of freshly placed concrete.
- 3. Do not place vibrators against reinforcement, attach to forms, or use to spread concrete.
- 4. Exposed Concrete: Vibrate with rubber type heads and, in addition, spade along forms with flat strap or plate.

L. Construction Joints:

- 1. Verify location and conformance with typical details; provide only where designated or approved by the Architect.
- 2. All horizontal and vertical construction joints to be thoroughly sandblasted to clean and roughen entire surface to minimum 1/4-inch relief exposing clean coarse aggregate solidly embedded in mortar matrix.
- 3. Just prior to depositing concrete, the surface of the construction joint shall be thoroughly wetted.

M. Contraction (Control) Joints in Slabs-on-Grade:

- 1. Construct contraction joints in slabs-on-ground to form panels of patterns

indicated on Construction Drawings. Use saw cuts 1/8" x 1/4 slab depth, unless otherwise indicated.

2. Time saw cutting to allow sufficient curing of concrete to prevent ravelled or broken edges.
3. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
4. If joint pattern not shown, provide joints not exceeding 15' in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third-bays).

N. Walls and Other Formed Elements:

1. Space points of deposit to eliminate need for lateral flow. Placing procedures of concrete in forms permitting escape of mortar, or flow of concrete itself, will not be permitted.
2. Level top surface upon stopping work.
3. Take special care to fill each part of the forms by depositing concrete directly as near final position as possible, and to force concrete under and around reinforcement, embedded items, without displacement.
4. After concrete has taken its initial set, care shall be exercised to avoid jarring forms or placing any strain on ends of projecting reinforcement.
5. Where backfill is placed against a wall, it shall be adequately shored until it has attained design strength.

O. Concrete Fill at Stairs:

1. Preparation:
 - a. Remove laitance, mortar, oil, grease, paint, etc.
 - b. Mechanically chip insufficiently rough surfaces.
 - c. Remove sand, etc., with compressed air.
2. Finish stairs to profiles shown with cove at base of risers and radius at top: tool grooves at edge of treads as detailed.

3.4 CURING

A. General Requirements:

1. Take curing measures immediately after casting and for measures other than application of curing compound, extend for seven days. The Architect may recommend longer periods based upon prevailing temperature, wind and relative humidity. Comply with ACI 318.
2. Avoid alternate wetting and drying and fluctuations of concrete temperature.
3. Protect fresh concrete from direct rays of sun, rain, freezing, drying winds, soiling, and damage.
4. Do not permit curing method to affect adversely finishes or treatments applied to finish concrete.

B. Curing Method, Typical: Obtain the Architect's approval of alternate measures.

1. Keep forms and concrete surfaces moist during period forms are required to remain in place.
2. Apply curing compound per manufacturers' recommendations, except at slabs-on-grade apply curing compound at 150% of manufacturer's recommended application coverage rate.

3.5 CLEANING, PATCHING AND DEFECTIVE WORK

- A. Where concrete is under strength, out of line, level or plumb, or shows objectionable cracks, honeycombing, rock pockets, voids, spalling, exposed reinforcement, signs of freezing or is otherwise defective, and, in the Architect's judgement, these defects impair proper strength or appearance of the work, the Architect will require its removal and replacement at the Contractor's expense.
- B. Immediately after stripping and before concrete is thoroughly dry, patch minor defects, form-tie holes, honeycombed areas, etc., with patching mortar. Patch shall match finish of adjacent surface unless otherwise noted. Remove ledges and bulges.
- C. Compact mortar into place and neatly file defective surfaces to produce level, true planes. After initial set, dress surfaces of patches mechanically or manually to obtain same texture as surrounding surfaces.
- D. Rock Pockets:
1. Cut out to full solid surface and form key.
 2. Thoroughly wet before casting mortar.

3. Where the Architect deems rock pocket too large for satisfactory mortar patching as described, cut out defective section to solid surface, key and pack solid with concrete to produce firm bond and match adjacent surface.

E. Cleaning

1. Insure removal of bituminous materials, form release agents, bond breakers, curing compounds if permitted and other materials employed in work of concreting which would otherwise prevent proper application of sealants, liquid waterproofing, and other delayed finishes and treatments.
2. Where cleaning is required, take care not to damage surrounding surfaces or leave residue from cleaning agents.
3. Patching of defective concrete requires DSA approval.

3.6 PROTECTION

- A. Protect concrete from injurious action of the elements and defacement of any nature during construction operations.
- B. Protect exposed corners of concrete from traffic or use which will damage them in any way.
- C. Make provisions to keep all exposed concrete free from laitance caused by spillage or leaking forms or other contaminants. Do not allow laitance to penetrate, stain, or harden on surfaces which have been textured.

3.7 FIELD QUALITY CONTROL

- A. The Owner's Testing Agency will:
 1. Perform testing in accordance with ACI 318 and CBC Section 1903A and 1905A.
 2. Review concrete mix designs.
 3. Inspect concrete and grout placement continuously.
 4. Test concrete to control slumps according to ASTM C143.
 5. Continuously monitor concrete temperature as it arrives on the site.
 6. Test concrete for required compressive strength in accordance with ACI 318:
 - a. Make and cure three specimen cylinders according to ASTM C31 for each 50 cubic yards, or fraction thereof, of each class poured

at site each day.

- b. Retain one cylinder for 7-day test and two for the 28-day test.
- c. Number each cylinder 1A, 1B, 1C, 2A, 2B, 2C, etc; date each set; and keep accurate record of pour each set represents.
- d. Transport specimen cylinders from job to laboratory after cylinders have cured for 24-hours on site. Cylinders shall be covered and kept at air temperatures between 60 and 80 degrees Fahrenheit.
- e. Test specimen cylinders at age 7-days and age 28-days for specified strength according to ASTM C39.
- f. Base strength value on average of two cylinders taken for 28-day test.

7. Test and inspect materials, as necessary, in accordance with ACI 318, MM Test Method 227 (Coarse Aggregates) and MM Test Method 217 (Fine Aggregates), for compliance with requirements specified in this section.

B. The Contractor shall:

1. Submit ticket for each batch of concrete delivered to job site. Ticket shall bear the following information:
 - a. Design mix number.
 - b. Signature or initials of ready mix representative.
 - c. Time of batching.
 - d. Weight of cement, aggregates, water and admixtures in each batch with maximum aggregate size.
 - e. Total volume of concrete in each batch.
 - f. Notation to indicate equipment was checked for contaminants prior to batching.
2. Pay the Owner's Testing Agency for taking core specimens of hardened structure and testing specimen according to ASTM C88 and C42 when laboratory tests of specimen cylinders show compressive strengths below specified minimum.

3.8 FINISH OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish Work or by other construction. Concrete surface shall have texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp proofing, painting or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.
- C. Architectural Concrete Finish: Integrally colored concrete, using specified color additive; smooth light sandblast surface.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 SLAB FINISHES

- A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.
 - 1. After placing slabs, plane surface to tolerances for floor flatness (FF) of 15. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms or rakes.
- B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand bed terrazzo, and as otherwise indicated.
 - 1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to tolerances of F_F18. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

- C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.
1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of FF20. Grind smooth surface defects which would telegraph through applied floor covering system.
 2. Floors to receive traffic topping shall have steel trowel finish.
 3. For concrete slab to receive wood flooring; finish to flatness and levelness tolerances which correspond to FF 45/FL 30 minimum overall for composite of all measured values per placement and FF 30/FL 20 minimum for any individual floor section. Slabs which do not meet the flatness and levelness criteria shall be repaired or replaced.
- D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.
- E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- F. Dry Shake Hardener, Wear-Resistant Finish: Provide hardened wear-resistant finish at Loading Dock floor slabs.
1. Apply dry shake materials for wear-resistant finish at rate of not less than 60 lbs. per 100 sq. ft., unless greater amount is recommended by material manufacturer.
 2. Immediately following first floating operation, uniformly distribute approximately 2/3 of required weight of dry shake material over concrete surface and embed by means of power floating. Follow floating operation with second shake application, uniformly distributing remainder of dry shake material at right angles to first application and embed by power floating.
 3. After completion of broadcasting and floating, apply trowel finish as herein specified. Cure slab surface with curing compound recommended by dry

shake hardener manufacturer. Apply curing compound immediately after final finishing.

3.10 CLEAN UP

- A. Perform Work under this Section to keep affected portions of building site neat, clean, and orderly. Remove, immediately upon completion of Work under this Section, surplus materials, rubbish, and equipment associated with or used in performance. Be aware that failure to perform clean-up operations within 24 hours of notice by Architect will be considered adequate grounds for having work done by others at no added expense to the Owner.

END OF SECTION

SECTION 036000
CONCRETE TESTS AND INSPECTIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Section Includes: Tests and inspections for work provided under following sections:
1. Section 03 20 00 - Reinforcement.
 2. Section 03 30 00- Cast-In-Place Concrete.

1.2 REFERENCES

- A. Requirements of GENERAL CONDITIONS and DIVISION NO. 1 apply to all Work in this Section.
- B. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work of this Section where cited by abbreviations noted below (latest editions apply).
1. California Code of Regulations. Title 24, 2019 edition, also known as California Building Code (CBC).
 2. American Society for Testing and Materials (ASTM).
 3. American Concrete Institute's "Building Code Requirements for Reinforced Concrete" (ACI 318).
 4. American Welding Society's "Recommended Practices for Welding Reinforcing Steel, Metal Inserts, and Connections in Reinforced Concrete Construction" (AWS D1.4).
 5. State of California, Business and Transportation Agency, Division of Highways "Materials Manual" (MM).
 6. Statement of Structural Tests and Special Inspections (DSA T&I form)

1.3 SUBMITTALS

- A. The Contractor shall submit:

1. Certified copies of mix designs for concrete classes A, B, C and lightweight including compressive strength test reports.
2. Certification that materials meet requirements specified.
3. Samples only as requested by the Architect.
4. Certification from vendor that samples originate from and are representative of each lot proposed for use.

B. The Owner's Testing Agency will submit reports on tests and inspections performed to the Owner, the Architect, and the Contractor.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. The Contractor shall supply labor, transport and on-site storage facilities required by the Owner's Testing Agency for taking and preparing samples for testing.

1.5 JOB CONDITIONS

A. The Contractor shall:

1. Provide the Owner's Testing Agency with free access to places whether on or off the job site where materials are stored, proportioned, mixed or fabricated, to places where equipment is stored or serviced, and to job site during times of preparation, installation, erection, placement, curing and patching.
2. Sequencing, Scheduling: Notify the Architect in sufficient time prior to fabrication, field welding, mixing, or placement to permit testing and inspecting without delaying Work.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

A. The Owner's Testing Agency will:

1. Collect mill test reports for reinforcement.
2. Take samples from bundles at fabricators.
 - a. When bundles are identified by heat number and accompanied by mill analysis, two specimens shall be taken from each 10 tons, or fraction thereof, of each size and grade.

- b. When reinforcement is not positively identified by heat numbers or when random sampling is intended, two specimens shall be taken from each 2-1/2 tons, or fraction thereof, of each size and grade.
3. Test for tensile and bending strength.
4. Provide inspection of welding, including prior fit-up, welding equipment, weld quality and welder certification in accordance with AWS D1.4. Chemical analysis sufficient to determine carbon equivalent shall be performed when reinforcement does not conform to low-alloy steel requirements of ACI 318.

2.2 CAST-IN-PLACE CONCRETE

A. The Owner's Testing Agency will:

1. Review mix designs, certificates of compliance, and samples of materials the Contractor proposes to use.
2. Test and inspect materials, as necessary, in accordance with ACI 318, CMM Test 217 (Coarse Aggregates) and CMM Test 227 (Fine Aggregates), for compliance with requirements specified in Section 03 30 00, Cast-In-Place Concrete.
3. Take samples as required from the Contractor's designated sources.
4. Take one sample for each 100 tons of Portland cement except that, when used in bulk loading ready-mix plants where separate bins for pretested cement are not available, take grab samples for each shipment of cement placed in bin with not less than one sample being taken for each day's pour and subsequently test such samples if required by the Architect.
5. Test both coarse and fine aggregate by use of solution of sodium or magnesium sulfate, or both whenever in the judgment of the Architect such tests are necessary to determine quality of material. Perform such tests in accordance with ASTM C88. Loss shall not exceed 6-percent of either fine or coarse aggregate. Aggregate failing to comply with this requirement may be used in the Work provided it contains less than 2-percent of shale and other deleterious particles and shows a loss in soundness test of not more than 10-percent when tested in the sodium sulphate solution.
6. Inspect plant prior to any work to verify following:
 - a. Plant is equipped with approved metering devices for determining

moisture content of fine aggregate.

- b. Other plant quality controls are adequate. Continuously inspect quality and quantity of materials used in transit mixed concrete, in batched aggregates and ready-mixed concrete at mixing plant or other location where materials are measured.

PART 3 - EXECUTION

3.1 REINFORCEMENT

A. The Owner's Testing Agency will:

1. Test and inspect field welds as deemed necessary.
2. Inspect placement of reinforcement for conformance with Contract Documents.

3.2 CONCRETE, CAST-IN-PLACE

A. The Owner's Testing Agency will:

1. Perform testing in accordance with ACI 318.
2. Inspect concrete placement.
3. Test concrete to control slumps according to ASTM C143.
4. Continuously monitor concrete temperature as it arrives on the site.
5. Test concrete for required compressive strength as follows:
 - a. Make and cure three specimen cylinders according to ASTM C31 for each 50 cubic yards or 200 square feet of surface area, or fraction thereof, of each class poured at site each day.
 - b. Retain one cylinder for 7-day test and two for 28-day test.
 - c. Number each cylinder 1A, 1B, 1C, 2A, 2B, 2C, etc.; date each set; and keep accurate record of pour each set represents.
 - d. Transport specimen cylinders from job to laboratory. After cylinders have cured for 24 hours on site, cover cylinders and keep them at air temperatures between 60 and 80 degrees Fahrenheit.

- e. Test specimen cylinders at age seven days and age 28 days for specified strength according to ASTM C39.
- f. Base strength value on average of two cylinders taken for 28-day test.

B. The Contractor shall:

- 1. Submit ticket for each batch of concrete delivered to job site. Ticket shall bear following information:
 - a. Design mix number of the Contractor Testing Agency.
 - b. Signature or initials of ready mix representative.
 - c. Time of batching.
 - d. Weight of cement, aggregates, water and admixtures in each batch with maximum aggregate size.
 - e. Total volume of concrete in each batch.
 - f. Indication that all ingredients are as previously certified or approved for use in architectural concrete.
 - g. Notation to indicate equipment was checked for contaminants prior to batching.
- 2. Pay the Owner's Testing Agency for taking core specimens of hardened structure and testing specimen according to ASTM C42 when laboratory tests of specimen cylinders show compressive strengths below specified minimum.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Section Includes: Provision of structural steel as indicated on the Contract Drawings. Work includes but is not necessarily limited to the following:
1. Structural steel framing, including all structural steel shown on the structural drawings and all standard structural shapes, plates and rods shown on the Architectural, Mechanical and Electrical drawings that connect to the building structure.
 2. "Formwork", for installation of anchor bolts and other steel parts that are embedded in concrete to receive structural steel
 3. "Cast in Place Concrete" for grouting of base plates and bearing plates
 4. "Steel Decking"

1.2 REFERENCES

- A. Standards listed below apply where designation is cited in this Section. Where the applicable year of adoption of revision is not listed below, the latest edition applies.
- B. ASTM: Standards of the American Society for Testing and Materials (ASTM) apply where designated in this Section. Use applicable year of adoption or revision as published in Chapter 35 of the 2016 California Building Code.
- C. CBC: 2019 California Building Code
- D. ICC-ES Evaluation Report: Where designated in this Section, products shall have an active ICC Evaluation Service, Inc. Evaluation Report evidencing compliance with provisions of the 2019 California Building Code. Reports are available at www.icc-es.org
- E. American Institute of Steel Construction's
1. AISC 303: Code of Standard Practice for Steel Buildings and Bridges.
 - a. The General Conditions, Special Conditions and Division 1 shall govern in the case of conflicts and provisions of the AISC 303
 2. ANSI/AISC 341: Seismic Provisions for Structural Steel Buildings.

- F. American Welding Society's
 - 1. AWS C4.1: Criteria for Describing Oxygen-Cut Surfaces and Oxygen Cutting Surface Roughness Gauge, latest edition
 - 2. AWS D1.1: Structural Welding Code
 - 3. AWS D1.8: Structural Welding Code – Seismic Supplement
- G. Research Council on Structural Connections'
 - 1. RCSC Specification: Specification for Structural Joints Using ASTM A325 or A490 Bolts
- H. SSPC: Latest edition of Society for Protective Coatings surface preparation and painting specifications apply where cited in this Section

1.3 QUALITY ASSURANCE

- A. Steel Fabricator's Qualifications: Fabricator shall have had not less than 5 years' experience in fabrication of structural steel and be able to furnish evidence of his ability, facilities, proficiency of his personnel and completed projects.
- B. Steel Erector's Qualifications: Erector shall have had not less than 5 years' experience in erection of structural steel and be able to furnish evidence of his ability, facilities, proficiency of his personnel and completed projects.
- C. Welding Qualifications: Welding procedures, welders, and welding operations shall be qualified in accordance with AWS D1.1
 - 1. Welders performing complete penetration beam flange-to-column welds shall be job-qualified per AWS D1.1 procedures.
 - 2. Welders who have not performed welding for period of three or more months shall be re-qualified.
 - 3. Welders whose work fails to pass inspection shall be re-qualified before performing further welding.
 - 4. The Contractor shall pay costs of certifying qualifications.
- D. Welding Inspector Qualifications: All welding inspectors shall be AWS certified welding inspectors (CWI) as defined in AWS Standard and Guide for Qualification and Certification of Welding Inspectors, latest edition. Welding inspector's qualifications shall be submitted to the Structural Engineer for approval. Inspectors shall be trained and thoroughly experienced in inspecting welding operations. Comply with AWS section 6.1.3.
- E. Allowable Tolerances:
 - 1. Straightness of Structural Members:

- a. Members: Meet requirements of AISC Section M2.7.
2. Erection Tolerances: Individual pieces shall be erected so that deviation from plumb, level, and alignment shall not exceed 1 to 500.
 - a. Displacement of centerline of columns adjacent to elevator shafts, from established column line, shall not be more than one inch at any point.
 - b. Displacement of centerline of exterior columns, from established column line, shall be not more than 1-inch inward, or 2-inches away from, building line at any point.
- F. All steel shall conform to CBC requirements.

1.4 SUBMITTALS

- A. Manufacturer's literature describing products.
- B. Shop Drawings: Show complete information necessary for the fabrication and erection of structural-steel components in accordance with ANSI/AISC 360.
 1. For members and connections that are part of the seismic Load Resisting System, conform to additional requirements of ANSI/AISC 341, Section 5.2, and Appendix W2.2
 2. Identify surface preparation and finish
- C. Welding:
 1. Certification of Welder's Qualifications: Welders that will make welds in restricted access, such as, but not limited to, the bottom flange-to-column welds through a cope hole or access hole in the beam web, shall be qualified by the Contractor using the same welding procedure as will be used for production and a mock-up assembly that simulates the construction configuration.
 2. Welding Procedure Specification: All Welding Procedure Specification (WPS) shall be submitted to the Owner's Testing Agency and the Structural Engineer for review prior to the start of the work. The WPS's shall contain the actual values to be used for the welding parameters and variables so that instruction is provided to welders. For WPS's which require qualification, Procedure Qualification Records (PQR's) shall also be submitted for review. WPS's for Flux Core Arc Welding (FCAW) shall be qualified by testing in accordance with AWS D1.1, Section 5. Production welding heat input shall be limited based on the PQR. See attached forms.
 3. Weld Shrinkage and Distortion Control Plan: For highly restrained joints or where shrinkage is likely to cause problems, submit a mitigation plan to Owner's Testing Agency and the Structural Engineer for review to

determine compliance with the design intent.

4. Quality Control Plan: Submit plan to Owner's Testing Agency and Structural Engineer that addresses all inspection issues, including in-process and final inspection, addressed in AWS D1.1, including sections 6.1 through 6.6, including the qualifications of the Contractor/Fabricator/Erector's Inspectors and NDE personnel.
 5. Welding electrode data sheets for shop and field welding.
- D. Proofs of Compliance for Materials:
1. Certification that materials meet requirements specified.
 2. All steel which cannot be identified per CBC requirements as follows:
 - a. Certified reports of ladle analysis for all steel.
 - b. Certified reports of tensile, elongation, and bend tests.
- E. Samples: Provide continuously as requested by the Owner's Testing Agency.
- F. The Owner's Testing Agency will submit reports on test and inspections performed to the Owner, Architect, DSA and Contractor.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle packaged materials in original containers with seals unbroken and labels intact until time of use.
- B. Discharge materials carefully; do not dump onto ground.
- C. Store structural steel members, whether on or off site, above ground on platforms, skids, or other support; store other materials in weather-tight, dry place until time of use.

1.6 JOB CONDITIONS

- A. Provide the Owner's Testing Agency with free access to places whether on or off job site where materials are stored or fabricated, to places where equipment is stored or serviced, and to job site during time of laying out, erection or job-site fabrication.
- B. Sequencing, Scheduling:
 1. Notify the Architect in sufficient time prior to shop or field fabrication or erection to permit testing and inspection without delaying Work.
 2. Insure timely delivery of items to be embedded in work of other sections such as cast-in-place concrete; furnish setting drawings or templates and directions for installation.

PART 2- PRODUCTS

2.1 MATERIALS

- A. Steel Shapes, Bars, and Plates:
 - 1. WF: ASTM A992 as noted on drawing.
 - 2. Channels, angles, bars, and WT Shapes: ASTM A36 as noted on drawings.
 - 3. Plate: ASTM A36
- B. Steel Tubing: ASTM A500, Grade B, $F_y = 46$ ksi.
- C. Steel Pipe: ASTM A500, Grade C.
- D. Standard Threaded Fasteners:
 - 1. Machine Bolts and Nuts: ASTM A307, Grade A.
 - 2. Plain Washers: ANSI B18.22.1.
 - 3. Beveled Washers: ANSI B18.23.1.
- E.
 - 1. High Strength Bolts: One of the following, unless otherwise designated on Drawings.
 - a. ASTM A325, Type 1, heavy hex structural bolts with ASTM A 563, Grade C or DH heavy hex nuts and ASTM F 436 hardened washers
 - b. "Twist-Off " Bolts: ASTM F1852, Type 1, round head tension control bolts with ASTM A563, Grade C or Grade DH heavy hex nuts and ASTM F436 hardened washers.
- F. ASTM A307 Bolts: ASTM A307, Grade A, hex headed bolts furnished with ASTM A563, Grade A, hex nuts.
- G. Anchor Bolts: ASTM A307, F1554 Grade 36.
- H. Threaded Rods: ASTM A36.
- I. Welding Electrodes: E70. The weld metal used shall be rated for Charpy V-Notch (CVN) values of 20 Ft-Lbs at a -20°F . This may be determined based on the electrode classification system, or by performing CVN tests in accordance with the AWS A5.x filler metal specifications. SMAW electrodes shall be E7018.
- J. Seismic Force Resisting System (SFRS) Welds: All welds used in members and

- connections in the SFRS shall be made with filler metals meeting the requirements specified in clause 6.3 of structural welding code-Seismic supplement (AWS D1.8/D1.8M).
- H. Demand Critical Welds: Welds designated as demand critical weld shall be made with filler metals meeting the requirements specified in clause 6.3 of structural welding code-Seismic supplement (AWS D1.8/D1.8M).

2.2 FABRICATION

A. General Requirements:

1. Fabricate structural steel in accordance with AISC Manual of Steel Construction; AWS D1.1 Structural Steel Welding Code, section 8, Statically Loaded Structures, except as noted otherwise herein; and requirements of regulatory agencies.
2. Fabricate and preassemble work in shop to greatest extent possible.
3. Do shearing, flame cutting, and chipping carefully and accurately.
4. Do not drift to match misaligned holes. Where enlarging is required, ream and use larger bolt. Misaligned holes will subject members to rejection.
5. Coordinate as required for attachment of other work to structural steel.
6. Drill or punch holes for passage of reinforcing steel shapes, sections, plates, or bars as indicated on Contract Drawings. Notify architect of conditions not shown or noted.

B. Connections:

1. Shop Connections: Bolted or welded as noted.
2. Field Connections:
 - a. Locate field splices only where noted or approved by Architect.
 - b. Where connection is not shown, design in accordance with standard practices unless otherwise directed by the Architect.
 - c. Mark completely tightened bolts with identifying symbol.

C. Bolted Connections:

1. Punch or drill holes 1/16-inch larger than bolt size.
2. Ream unfair holes, but only up to next larger bolts size. Where unfairness exceeds maximum, weld hole in base material solid and drill hole of proper size.

3. As erection progresses, provide sufficient bolts to adequately resist dead load, lateral forces, and erection stresses.

D. Assembly with Standard Threaded Fasteners:

1. Beveled Washers: Provide under bolt heads or nuts resting surfaces exceeding five percent slope with respect to head or nut.
2. Draw up tight, check threads with chisel or provide approved lock washers or self-tightening nuts.

E. Assembly of High-Strength Structural Bolted Connections:

1. Meet requirements of RCSC and Fabrication article of this specification.
2. Connections shall be friction-type as defined in RCSC.
3. Provide hardened washers under head or nut of high strength bolts. Washer shall be provided under the element turned in the tightening procedure.
4. Provide direct tension indicator washers under the head of slip-critical high strength bolts.

F. Welded Construction: (shop and field)

1. Weld in accordance with AISC and AWS D1.1. Beam flange-to-column welds shall be made with the Shielded Metal Arc Welding (SMAW) or Flux Cored Arc Welding (FCAW) gas shielded or self-shielding processes.
2. Welds that will be exposed to view on the completed Work shall be inspected and burrs, flux, welding oxide air spots, and discolorations removed. Grind, polish, or finish as specified or shown. Exterior welds shall also be watertight.
3. Butt-welds and/or Groove Welds:
 - a. Provide complete penetration welds.
 - b. If welded from one side, use back-up plates.
 - c. If welded from both sides, back-scarf and clean root weld before depositing weld metal from second side.
 - d. Preheat for minimum three inches on each side of welds; maintain interpass temperatures in accordance with ASWS D1.1.
 - e. Weld "dams" or "end dams" shall not be used.

- f. Weld tabs (also known as weld "extension" tabs or "run off" tabs) shall be used. After the weld has been completed, the weld tabs shall be removed, the weld ground to a smooth contour, and magnetic particle tested for defects.
- g. If groove weld backing (also known as "backup or backer bars") are used under the bottom beam flange-to-column complete penetration groove weld, the weld backing shall be removed, the removal area ground to sound, bright metal, and the area subjected to magnetic particle examination for defects. A reinforcing fillet weld, sized at least 1/4 of the bottom flange thickness, shall be placed in this location, but need not be greater than 3/8 inch.
- h. If groove weld backing is used under the top beam flange-to-column-flange complete penetration groove weld, and is not removed, the backing shall not exceed 1/4-inch thickness and shall be attached to the column by either a fillet weld along the complete bar length on the underside of the bar, or by a partial joint penetration groove weld from the underside of the backing for the full length of the backing. Other methods of welding the backing to the column may be used subject to the Engineer's approval.

4. Grind exposed welds smooth.

5. Column Bases: Prepare in accordance with the provision of AWS and AISC Specification M2.8.

G. Camber: Provide camber as indicated on contract drawings by mill rolling techniques or in accordance with AISC Specification M2.1.

2.3 FINISHES

A. Preparation of Surfaces:

- 1. Thoroughly clean mill scale, rust, dirt, grease, and other foreign matter from steel prior to painting.
- 2. Where hand-cleaning methods are not adequate, clean in accordance with SSPC-SP1, SSPC-SP 2, or SSPC-SP 7, as required.

B. Prime Painting:

- 1. Apply one (1) coat of primer to structural steel surfaces permanently exposed to weather.
- 2. Apply primer in accordance with manufacturer's specifications to provide minimum dry film thickness of 1.0 mils per coat.
- 3. Permit thorough drying before shipment.

4. Do not prime in temperatures lower than 45 degrees Fahrenheit.
- C. Do not prime paint following surfaces:
1. Surfaces to be encased in concrete except initial 2-inches.
 2. Surface to be field welded.
 3. Surface to receive sprayed-on fireproofing.
 4. Contact surfaces joined by high-strength bolts.

2.4 SOURCE QUALITY CONTROL

- A. The Owner's Testing Agency will:
1. Review ladle analysis and certificates of compliance. Where certification is questionable, test material to verify compliance per CBC requirement.
 2. Inspect shop fabrication per CBC requirement.
 3. Inspect bolted connection made in the shop. Test high-strength bolts, nuts, and washers per CBC requirement.
 4. Review Welding Procedure Specifications for conformance with AWS D1.1 and the electrode manufacturer's recommendations.
 5. Inspect shop welding, including welding equipment, weld quality, welder certification and conformity with drawings.
 6. Ultrasonic test all complete penetration welds
 7. Forward copies of all product and procedure certificates, data sheets, and test reports to the Architect.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine units of Work to be placed and verify that:
1. All anchor bolts have been installed properly.
 2. Do not begin erection before unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Supervise setting of anchor bolts and other embedded items required for erection

of structural steel. Ensure correct bearing of steel and correct location of anchor bolts.

3.3 ERECTION

A. General Requirements:

1. Erect structural steel in accordance with AISC Manual of Steel Construction and AWS D1.1 Structural Steel Welding Code, section 8, Statically Loaded Structures.
2. Requirements for bolted and welded connections specified in Section 2 apply to shop and field connections.
3. Ensure steel is plumb, level and aligned as specified before making final connections.
4. Leveling of base plates shall be achieved through the use of leveling nuts and anchor bolts.
5. Where erection requires performing work of fabrication on site, conform to applicable standards for fabrication.
6. Field corrections of major members will not be permitted without the Architect's prior written approval.

B. Field Assembly:

1. Clean bearing surfaces and surfaces to be in permanent contact before assembling members.
2. Accurately assemble frames to lines and elevation indicated, within erection tolerances noted.
3. Ensure assembly is plumb, level, and aligned before final connecting.
4. Do not fasten splices of compression members, before abutting surfaces have been brought completely into contact.
5. Installation of high-strength bolts shall conform to ASTM A325 for slip critical type connection in accordance with RCSC. Provide washer under head or nut of high strength bolts. Washer shall be provided under the element being turned during tightening. Bolts in welded connections shall be tensioned after completion of welding.
6. Mill scale shall be removed from the column in the area where the beam flanges will be welded to the column.
7. Flat reinforcing plates aligned parallel to the top and bottom beam flange, if used, shall be installed in accordance with these requirements: The reinforcing plate for the bottom flange shall be welded to the column in

the fabricating shop using a complete joint penetration double bevel groove joint, e.g., AWS D1.1 configuration TC-U5. This weld shall be inspected by ultrasonic examination. The balance of the welding is to be done in the field. The reinforcing plate for the top flange shall be shipped loose. After the top flange has been welded to the column, and ultrasonically examined and accepted, the top flange weld surface shall be prepared, the reinforcing plate fitted for welding, the reinforcing plate welded to the column flange with a CJP single groove weld, e.g., AWS D1.1 configuration TC-U4. The reinforcing plate shall be restrained from rotation during welding to the column. After completion of the reinforcing plate to the column weld, the reinforcing plate shall be welded to the top flange.

- C. Gas Cutting: Use of flame cutting torch will be permitted only after the Architect's prior written approval and only where metal cut will not carry stress during cutting, stresses will not be transmitted through flame-cut surface and cut surfaces will not be visible.
 - 1. Make cuts smooth and regular in contour.
 - 2. To determine effective width of members so cut, deduct 1/8-inch from least width at cut edge.
 - 3. Make radius or re-entrance of cut fillet as large as practical, but in no case less than 1-inch.
 - 4. Do not use flame cutting torch to align bolt holes.
- D. Field Touch-Up Painting: After erection, touch-up paint field connections and abrasions resulting from the Work of this Section with same paint used for shop prime painting.

3.4 CLEANING

- A. After erection, thoroughly clean surfaces of foreign or deleterious matter such as dirt, mud, oil, or grease that would impair bonding of fireproofing concrete.

3.5 FIELD QUALITY CONTROL

- A. The Owner's Testing Agency shall:
 - 1. Re-qualify welders who will be performing complete penetration beam flange-to-column welds.
 - 2. Inspect all field welding, including welding equipment, electrodes, weld quality, welder certification, and conformity with drawings.
 - 3. Review Welding Procedure Specifications for conformance with AWS D1.1 and the electrode manufacturer's recommendations.
 - 4. Ultrasonic test all complete penetration and partial penetration welds.

5. Provide magnetic particle inspection of weld backing removal area and fillet welds on continuity plates.
6. Inspect and test high strength bolted connections in accordance with CBC Section 2213A.
7. Bolt assemblies, which include direct tension indicators, shall be sampled and tested on a daily basis to verify proper indication of deformation with required bolt tension for each size and lot. The inspector shall have a torque wrench, calibrated daily, to verify correlation with proper tension as the installation proceeds. Test at least 10 percent of the bolts with a minimum of 2 per connection from the start of bolting and until waived by the DSA Field Engineer upon demonstration of continued good workmanship.
8. Inspect erected structural steel as required to establish conformity of Work with reviewed shop drawings and Contract Drawings.
9. Perform testing and inspection of shear connectors in accordance with requirements of AWS D1.1, except that the test studs shall be subjected to a 90-bend test by striking them with a heavy hammer. After the bend test, the weld section shall not exhibit any tearing or cracking.

END OF SECTION

SECTION 05 5000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel framing and supports for ceiling-hung toilet compartments.
 - 2. Steel framing and supports for countertops.
 - 3. Steel framing and supports for mechanical and electrical equipment.
 - 4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 5. Steel girders for supporting wood frame construction.
 - 6. Steel pipe columns for supporting wood frame construction.
 - 7. Slotted channel framing.
 - 8. Shelf angles.
 - 9. Structural-steel door frames.
 - 10. Miscellaneous steel trim including steel angle corner guards steel edgings and loading-dock edge angles.
 - 11. Metal bollards.
 - 12. Vehicular barrier cable systems.
 - 13. Abrasive metal nosings and thresholds.
 - 14. Loose bearing and leveling plates for applications where they are not specified in other Sections.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
 - 2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
- C. Related Requirements:
 - 1. Section 05 1200 "Structural Steel Framing" for steel framing, supports, elevator machine beams, hoist beams, divider beams, door frames, and other steel items attached to the structural-steel framing.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
 - 2. Fasteners.
 - 3. Shop primers.
 - 4. Shrinkage-resisting grout.
 - 5. Slotted channel framing.
 - 6. Abrasive metal nosings and thresholds.
 - 7. Cast-iron wheel guards.

- B. Shop Drawings: Show fabrication and installation details.[Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.] Provide Shop Drawings for the following:
 - 1. Steel framing and supports for ceiling-hung toilet compartments.
 - 2. Steel framing and supports for countertops.
 - 3. Steel framing and supports for mechanical and electrical equipment.
 - 4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 5. Steel girders for supporting wood frame construction.
 - 6. Steel pipe columns for supporting wood frame construction.
 - 7. Slotted channel framing.
 - 8. Shelf angles.
 - 9. Structural-steel door frames.
 - 10. Miscellaneous steel trim including steel angle corner guards steel edgings and loading-dock edge angles.
 - 11. Metal bollards.
 - 12. Vehicular barrier cable systems.
 - 13. Abrasive metal nosings and thresholds.
 - 14. Loose bearing and leveling plates for applications where they are not specified in other Sections.

- C. Samples for Verification: For each type and finish of extruded nosing.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.

- B. Mill Certificates: Signed by stainless steel manufacturers, certifying that products furnished comply with requirements.

- C. Welding certificates.

- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

- E. Research Reports: For post-installed anchors.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Stainless Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 304.
- D. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 304.
- E. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.
- F. Rolled-Stainless Steel Floor Plate: ASTM A793.
- G. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.
- H. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.
- I. Zinc-Coated Steel Wire Rope: ASTM A741.
 - 1. Wire Rope Fittings: Hot-dip galvanized-steel connectors with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.
- J. Stainless Steel Wire Rope: Wire rope manufactured from stainless steel wire complying with ASTM A492, Type 316.
 - 1. Wire Rope Fittings: Stainless steel connectors, Type 316, with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.
- K. Steel Prestressing Strand: ASTM A416/A416M, Grade 270, low-relaxation, seven-wire, with 0.9-lb/sq. ft. zinc coating.
 - 1. Steel Prestressing Strand Fittings: Hot-dip galvanized-steel anchors and connectors with capability to sustain, without failure, a load equal to minimum breaking strength of steel prestressing strand with which they are used.
- L. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: As indicated.
 1. Material: Galvanized steel, ASTM A653/A653M, structural steel, Grade 33, with G90 coating; ; 0.108-inch nominal thickness.
- M. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.
- N. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.
- O. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.
- P. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.
- Q. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.
- R. Bronze Extrusions: ASTM B455, Alloy UNS No. C38500 (extruded architectural bronze).
- S. Bronze Castings: ASTM B584, Alloy UNS No. C83600 (leaded red brass) or UNS No. C84400 (leaded semired brass).
- T. Nickel Silver Extrusions: ASTM B151/B151M, Alloy UNS No. C74500.
- U. Nickel Silver Castings: ASTM B584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

2.2 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
1. Provide stainless steel fasteners for fastening aluminum and stainless steel.
 2. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.
- D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.
- E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.
- G. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast

steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.

- H. Post-Installed Anchors: [Torque-controlled expansion anchors] [or] [chemical anchors].
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.
- I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.3 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 09 9113 "Exterior Painting." Section 09 9123 "Interior Painting."
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- H. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- I. Concrete: Comply with requirements in Section 03 3000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.
 - 1. Provide bearing plates welded to beams where indicated.
 - 2. Drill or punch girders and plates for field-bolted connections where indicated.
 - 3. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches o.c.

- D. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.
 - 1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
 - 2. Unless otherwise indicated, provide 1/2-inch baseplates with four 5/8-inch anchor bolts and 1/4-inch top plates.
- E. Galvanize miscellaneous framing and supports where indicated.
- F. Prime miscellaneous framing and supports with [zinc-rich primer] [primer specified in Section 09 9600 "High-Performance Coatings"] where indicated.

2.6 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
 - 1. Provide mitered and welded units at corners.
 - 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize[**and prime**] shelf angles located in exterior walls.
- D. Prime shelf angles located in exterior walls with [zinc-rich primer.] [primer specified in Section 09 9600 "High-Performance Coatings."]
- E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.7 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize and prime exterior miscellaneous steel trim.
- D. Prime exterior miscellaneous steel trim with zinc-rich primer.

2.8 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

- B. Galvanize bearing and leveling plates.
- C. Prime plates with [zinc-rich primer.] [primer specified in Section 09 9600 "High-Performance Coatings."]

2.9 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.10 GENERAL FINISH REQUIREMENTS

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.11 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with primers specified in Section 09 9113 "Exterior Painting" primers specified in Section 09 9123 "Interior Painting" unless indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Items Indicated to Receive Primers Specified in Section 09 9600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 4. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
 - 5. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.12 ALUMINUM FINISHES

- A. As-Fabricated Finish: AA-M12.
- B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Cast Aluminum: Heavy coat of bituminous paint.
 - 2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for ceiling hung toilet partitions securely to, and rigidly brace from, building structure.
- C. Anchor shelf angles securely to existing construction with anchor bolts.

- D. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
 - 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.
- E. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installation of Bearing and Leveling Plates" Article.
 - 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLATION OF BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 REPAIRS

- A. Touchup Painting:
 - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
 - 2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 9113 "Exterior Painting." Section 09 9123 "Interior Painting."
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 05 5000

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Section Includes: Provision of all lumber framing, rough hardware and blocking as indicated in the contract drawings.

1.2 REFERENCES

- A. Requirements of GENERAL CONDITIONS and DIVISION NO. 1 apply to all Work in this Section.
- B. Published Specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to Work in this Section where cited by abbreviations noted below (latest editions apply).
 - 1. California Code of Regulations. Title 24, 2019 edition, also known as California Building Code (CBC).
 - 2. (APA) - American Plywood Association, "Guide to Plywood Grades".
 - 3. (PS) - United States Product Standard, PS-1 "Construction and Industrial Plywood".
 - 4. (UL) - Underwriters' Laboratories, Inc., "Fire Hazard Classification, FR-S".
 - 5. (WCLIB) - West Coast Lumber Inspection Bureau, "Standard Grading Rules No. 17".
 - 6. (WWPA) - Western Wood Products Association, "Grading Rules for Lumber".
 - 7. (AWPA) - American Wood Preservers Association Standards.
 - 8. (ASTM) - American Society of Testing and Materials.

1.3 SUBMITTALS

- A. Shop Drawings of all specially fabricated rough hardware.
- B. Certificates of compliance with standards specified.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Provide proper facilities for handling and storage of materials to prevent damage

to edges, ends, and surfaces.

- B. Keep materials dry. Where necessary, stack materials off ground on level flat forms, fully protected from weather.

1.5 JOB CONDITIONS

- A. Environmental Requirements: Maintain uniform moisture content of lumber at not more than 19-percent before, during, and after installation.
- B. Sequencing, Scheduling: Coordinate details with other Work supporting, adjoining or fastening to rough carpentry Work.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Rough Carpentry:
 - 1. Sills on Concrete: Foundation grade redwood or pressure treated Douglas Fir.
 - 2. Lumber (Wood Framing): Meet requirements of following minimum grades.

Item	
Studs	D.F. No. 1
Plates	D.F. No. 1
Beams	D.F. No. 1
Joists	D.F. No. 1
Posts	D.F. No. 1
Blocking	D.F. No. 2
 - 3. Plywood: Provide thickness, grade, and panel identification index shown on general notes and drawings.
 - 4. All wood framing members for roof and wall framing to be certified in accordance with the Forest Stewardship Council (FSC) guidelines. Provide Certification.
- B. Rough Hardware: All exterior hardware and fasteners attached to pressure treated members shall be hot-dipped galvanized.
 - 1. Nails: Common wire, typical.
 - 2. Powder Driven Fasteners: Tempered steel pins with special corrosion-resistant finish. Provide guide washers to accurately control penetration, maximum 3/4-inch. Accomplish fastening by low-velocity piston-driven powder-actuated tool. Pins and tool: Hilti Fastening Systems; Impex Tool Corporation; or equal product substituted per Section 01630.

3. Expansion Bolts: Reverse cone, self-wedging, expansion type, tightening of nut or increased tension on bolt shank shall act to force wedges outward to create positive increased resistance to withdrawal, Ramset/Read Head "Tru-Bolt", Hilti Kwik - TZ or equal product substituted per Section 01630.
4. Metal Timber Framing Connectors: Fabricate from hot-dipped galvanized steel. Connectors shall be at least 16-gauge material, 1/8-inch plate materials where welded, unless otherwise shown or specified, punched for nailing. Nails and nailing shall conform to the manufacturer's instructions, with a nail provided for each punched hole. Rough hardware is manufactured by Simpson Company or equal product substituted per Section 01630.
5. Substitutions of all hardware are subject to review by DSA.
6. Miscellaneous Hardware: Provide all common screws, bolts, fastenings, washers and nuts required to complete rough carpentry Work.

2.2 TREATMENTS

- A. Fire-Retardant Treatment: Same as Koppers Co., Inc.'s "Non-Com" J.H. Baxter and Co.'s "Baco-Pyresote"; or equal product substituted per Section 01630.
- B. Preservative Treatment: Furnish in accordance with AWPA.

2.3 FABRICATION

- A. Preparation (Finish Carpentry):
 1. Verify measurements at job site.
 2. Verify details and dimensions of equipment and fixtures integral with finish carpentry for proper fit and accurate alignment.
 3. Coordinate details with other work supporting, adjoining, or fastening to casework.
- B. Lumber:
 1. Air- or kiln-dry to maximum 19-percent moisture content, except maximum 15-percent for 2-inch lumber at time of surfacing.
 2. Furnish surfaced four sides, S4S, unless otherwise noted.
 3. Size to conform with rules of governing standard. Sizes shown are nominal unless otherwise noted.
- C. Wood Treatments:

1. Fire-Retardant Treatment:
 - a. Fire-retardant treat only wood blocking supporting truss joists on steel beams.
 - b. Treat in accordance with AWPA C20 and approved manufacturer's recommendations.
2. Preservative Treatment:
 - a. Treat lumber and plywood sheathing exposed to weather.
 - b. Lumber: Treat in accordance with AWPA C2.
 - c. Plywood: Treat in accordance with AWPA C9.
 - d. After treatment and prior to shipping, air- or kiln-dry lumber to maximum 12-percent moisture content.

2.4 SOURCE QUALITY CONTROL

- A. Lumber shall bear grade-trademark or be accompanied by certificate of compliance of appropriate grading agency.
- B. Plywood shall bear APA grade-trademark.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive rough carpentry Work and verify following:
 1. Completion of installation of building components to receive rough carpentry Work.
 2. That surfaces are satisfactory to receive Work.
 3. That spacing, direction, and details of supports are correct to accommodate installation of blocking, backing, stripping, furring and nailers.
 4. That all anchor bolts and holdown bolts are properly installed.

3.2 INSTALLATION

- A. Cutting: Perform all cutting, boring, and similar Work required.
- B. Studs, Joists, Beams, and Posts: Install all members true to line. No wood shingle shims are permitted. Place joists with crown up; maximum 1/4-inch

crown permitted.

- C. Nail joints in accordance with applicable requirements of the CBC Table 2304.9.1 unless otherwise shown or specified. Pre-drill where nails tend to split wood.
- D. Bolt holes to be 1/16-inch oversize. Threads shall not bear on wood. Use standard malleable iron washers against wood. Carriage bolts require washers under the nut only.
- E. Provide blocking, grounds, nailers, stripping, and backing as shown and as required to secure other Work.
- F. Maintain 1/8-inch gap between all plywood panel edges.
- G. Do not utilize plywood sheets having a width smaller than 2-feet 0-inches.
- H. Plywood flooring shall be field glued with adhesives meeting APA specification AFG-01 applied in accordance with the manufacturer's recommendations. Apply continuous line of glue on joists and in groove of tongue and groove panels.
- I. Where wood is cut, sawed, planed, bored or marred after preservative or fire-retardant treatment, apply two heavy brush coats of same material used in treatment.
- J. Nail heads shall be driven flush with plywood surface. Overdriven nails (nails which fracture the outer ply layer) shall be replaced one for one.
- K. Screws (Wood or Lag): Screws shall be screwed and not driven into place. Screw holes shall be predrilled to the same diameter and depth of shank. Holes for threaded portion shall be predrilled less than or equal to the diameter of the root of the thread. Provide standard cut washers under head of lag screws.
- L. Where called out on plan, sills under bearing, exterior and shear walls shall be bedded on 1/2-inch minimum drypack or grout to obtain continuous bearing.

3.3 CLEANING AND ADJUSTING (Finish Carpentry)

- A. Remove damaged or otherwise disfigured portions and replace with new prior to the Owner's acceptance.
- B. Wash finished Work in strict accordance with product manufacturer's directions and ensure that washed surfaces do not differ from clean unwashed surfaces. Any difference will be considered unsatisfactory work.

3.4 FIELD QUALITY CONTROL

- A. The Owner's Testing Agency shall:
 - 1. Inspect erected timber framing as required to establish conformity of work with Drawings.

2. Inspect all bolted connections.
3. Inspect all timber connectors per CBC requirements.
4. Inspect roof diaphragm nailing for nail size, spacing and penetration at plywood panel edges, and special nailing at collector and drag members.
5. Inspect shear wall nailing for nail size, spacing and penetration at plywood panel edges, and nailing at holdown posts.

END OF SECTION

SECTION 06 1053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Framing with dimension lumber.
 - 2. Rooftop equipment bases and support curbs.
 - 3. Wood blocking, cants, and nailers.
 - 4. Wood furring.
 - 5. Wood sleepers.
 - 6. Utility shelving.
 - 7. Plywood backing panels.
- B. Related Requirements:
 - 1. Section 06 1600 "Sheathing" for sheathing, subflooring, and underlayment.

1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Preservative-treated wood.
 - 2. Fire-retardant-treated wood.
 - 3. Power-driven fasteners.
 - 4. Post-installed anchors.
 - 5. Metal framing anchors.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - 3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPAC U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - 2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
 - 1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.

- D. Application: Treat all miscellaneous carpentry unless otherwise indicated.
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 - 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

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

- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Treatment shall not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
 - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 - 4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664, and design value adjustment factors shall be calculated according to ASTM D6841.

- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.

- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
 - 1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.

- E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.

- F. Application: Treat all miscellaneous carpentry unless otherwise indicated.
 - 1. Framing for raised platforms.
 - 2. Concealed blocking.
 - 3. Roof framing and blocking.

4. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
5. Plywood backing panels.

2.4 DIMENSION LUMBER FRAMING

- A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade of any of the following species:
1. Hem-fir (north); NLGA.
 2. Mixed southern pine or southern pine; SPIB.
 3. Spruce-pine-fir; NLGA.
 4. Hem-fir; WCLIB or WWPA.
 5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 6. Northern species; NLGA.
 7. Eastern softwoods; NeLMA.
 8. Western woods; WCLIB or WWPA.
- B. Other Framing: No. 2 Construction or No. 2 grade of the following species:
1. Hem-fir (north); NLGA.
 2. Southern pine; SPIB.
 3. Douglas fir-larch; WCLIB or WWPA.
 4. Southern pine or mixed southern pine; SPIB.
 5. Spruce-pine-fir; NLGA.
 6. Douglas fir-south; WWPA.
 7. Hem-fir; WCLIB or WWPA.
 8. Douglas fir-larch (north); NLGA.
 9. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
 2. Nailers.
 3. Rooftop equipment bases and support curbs.
 4. Cants.
 5. Furring.
 6. Grounds.
 7. Utility shelving.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of the following species:
1. Hem-fir (north); NLGA.
 2. Mixed southern pine or southern pine; SPIB.
 3. Spruce-pine-fir; NLGA.
 4. Hem-fir; WCLIB or WWPA.
 5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 6. Western woods; WCLIB or WWPA.
 7. Northern species; NLGA.
 8. Eastern softwoods; NeLMA.
- C. Concealed Boards: 19percent maximum moisture content of any of the following species and grades:
1. Mixed southern pine or southern pine, No. 2 grade; SPIB.

2. Northern species, No. 2 Common grade; NLGA.
 3. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1,, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on **[ICC-ES AC01] [ICC-ES AC58] [ICC-ES AC193] [or] [ICC-ES AC308]** as appropriate for the substrate.
1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
 2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Do not splice structural members between supports unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
 - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
 - 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- H. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- J. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- K. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.
- L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILER

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 INSTALLATION OF WOOD FURRING

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal-size furring horizontally at 24 inches o.c.
- C. Furring to Receive Gypsum Board Plaster Lath: Install 1-by-2-inch nominal-size furring vertically at 16 inches o.c.

3.4 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 1053

SECTION 06 1600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.
3. Parapet sheathing.
4. Composite nail base insulated roof sheathing.
5. Subflooring.
6. Underlayment.
7. Sheathing joint and penetration treatment.

- B. Related Requirements:

1. Section 06 1053 "Miscellaneous Rough Carpentry" for plywood backing panels.
2. Section 07 2500 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1. Review air-barrier and water-resistant glass-mat gypsum sheathing requirements and installation, special details, transitions, mockups, air-leakage testing, protection, and work scheduling that covers air-barrier and water-resistant glass-mat gypsum sheathing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5516.

4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 5. For air-barrier and water-resistant glass-mat gypsum sheathing, include manufacturer's technical data and tested physical and performance properties of products.
- B. Shop Drawings: For air-barrier and water-resistant glass-mat gypsum sheathing assemblies.
1. Show locations and extent of sheathing, accessories, and assemblies specific to Project conditions.
 2. Include details for sheathing joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 3. Include details of interfaces with other materials that form part of air barrier.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, including list of ABAA-certified installers and supervisors employed by Installer, who work on Project and testing and inspecting agency.
- B. Product Certificates: From air-barrier and water-resistant glass-mat gypsum sheathing manufacturer, certifying compatibility of sheathing accessory materials with Project materials that connect to or that come in contact with the sheathing.
- C. Product Test Reports: For each air-barrier and water-resistant glass-mat gypsum sheathing assembly, indicating compliance with specified requirements, for tests performed by a qualified testing agency.
- D. Evaluation Reports: For the following, from ICC-ES:
1. Wood-preservative-treated plywood.
 2. Fire-retardant-treated plywood.
 3. Foam-plastic sheathing.
 4. Air-barrier and water-resistant glass-mat gypsum sheathing.
- E. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer of air-barrier and water-resistant glass-mat gypsum sheathing.
1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- B. Testing Agency Qualifications:
1. For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs

inspections to verify that the material bearing the classification marking is representative of the material tested.

2. For testing and inspecting agency providing tests and inspections related to air-barrier and water-resistant glass-mat gypsum sheathing: an independent agency, qualified according to ASTM E329 for testing indicated, and certified by Air Barrier Association of America, Inc.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- B. Air-Barrier and Water-Resistant Glass-Mat Gypsum Sheathing Performance: Air-barrier and water-resistant glass-mat gypsum sheathing assembly, and seals with adjacent construction, shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations[, **tie-ins to installed waterproofing**] [, **tie-ins to other installed air barriers**], and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

2.2 WOOD PANEL PRODUCTS

- A. Emissions: Products shall meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. [<Double click to insert sustainable design text for certified wood.>](#)
- C. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- D. Factory mark panels to indicate compliance with applicable standard.

2.3 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-

test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Use treatment that does not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
 - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.
 - 4. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D5516 and design value adjustment factors shall be calculated according to ASTM D6305. Span ratings after treatment shall be not less than span ratings specified.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: Treat plywood indicated on Drawings, and the following:
 - 1. Roof and wall sheathing within 48 inches of fire party walls.
 - 2. Roof sheathing.
 - 3. Subflooring and underlayment for raised platforms.

2.4 WALL SHEATHING

- A. Plywood Sheathing Exposure 1, Structural I sheathing.
 - 1. Span Rating: Not less than 24/0.
 - 2. Nominal Thickness: Not less than 1/2 inch.

2.5 ROOF SHEATHING

- A. Plywood Sheathing: , Exterior, Structural I sheathing.
 - 1. Span Rating: Not less than 24/0.
 - 2. Nominal Thickness: match existing adjacent material thickness. Fur as required to match thickness of existing materials.

2.6 FASTENERS

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

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
 2. For roof and wall sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.
- E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C1002.
 2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C954.
- G. Screws for Fastening Composite Nail Base Insulated Roof Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117. Provide washers or plates if recommended by sheathing manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
 3. ICC-ES evaluation report for fastener.
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

- E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall and Roof Sheathing:
 - a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 06 1600

SECTION 06 2023 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior trim, including non-fire-rated interior door frames.
 - 2. Interior plywood paneling.
- B. Related Requirements:
 - 1. Section 06 1000 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
 - 2. Section 06 1053 "Miscellaneous Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
 - 3. Section 09 9123 "Interior Painting" for priming and backpriming of interior finish carpentry.

1.3 DEFINITIONS

- A. MDF: Medium-density fiberboard.
- B. MDO: Plywood with a medium-density overlay on the face.
- C. PVC: Polyvinyl chloride.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.
- D. Samples for Verification:

1. For each species and cut of lumber and panel products with nonfactory-applied finish, with half of exposed surface finished; 50 sq. in. for lumber and 8 by 10 inches for panels.
2. For foam-plastic moldings, with half of exposed surface finished; 50 sq. in..
3. For each finish system and color of lumber and panel products with factory-applied finish, 50 sq. in. for lumber and 8 by 10 inches for panels.

1.5 QUALITY ASSURANCE

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.
 1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
 2. Provide for air circulation around stacks and under coverings.
- B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or blotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.
 1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber, mark grade stamp on end or back of each piece.
- B. Softwood Plywood: DOC PS 1.
- C. Hardboard: ANSI A135.4.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC1.
1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent, respectively.
 2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
 4. Do not use material that is warped or does not comply with requirements for untreated material.
 5. Mark lumber with treatment-quality mark of an inspection agency approved by the ALSC's Board of Review.
 - a. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
 6. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
 - a. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.
 7. Application: Where indicated on Drawings

2.3 INTERIOR TRIM

- A. Softwood Lumber Trim for Transparent Finish (Stain or Clear Finish):
1. Species and Grade:
 - a. Eastern white pine; NeLMA or NLGA C Select D Select.
 - b. Douglas fir-larch or Douglas fir south; NLGA, WCLIB, or WWPA Superior or C & Btr finish.
 2. Maximum Moisture Content: 15 percent.
 3. Finger Jointing: Not allowed.
 4. Face Surface: Surfaced (smooth).
- B. Foam-Plastic Moldings: Molded product of shapes indicated, with a tough outer skin on exposed surfaces; factory primed. Exposed surfaces shall not be shaped after molding.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 2. Density: Not less than 20 lb/cu. ft..
 3. Flame-Spread Index: Not more than [75] <Insert number> when tested according to ASTM E84.
 4. Thickness: Not more than 1/2 inch.
 5. Width: Not more than 8 inches.
 6. Patterns: [As indicated by manufacturer's designations] [Match Architect's samples].

2.4 PANELING

- A. Hardwood Veneer Plywood Paneling: Manufacturer's stock hardwood plywood panels complying with HPVA HP-1.
1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:

- a. [Chesapeake Plywood LLC.](#)
- b. [Holland Southwest International.](#)
- c. [Houston Plywood Industry, Inc.](#)
2. Face Veneer Species and Cut: Rotary-cut white birch.
3. Veneer Matching: Selected for similar color and grain.
4. Backing Veneer Species: Same species as face veneer
5. Construction: Veneer core.
6. Thickness: 1/4 inch.
7. Panel Size:
 - a. 48 by 96 inches.
8. Glue Bond: Type II (interior).
9. Face Pattern: None
10. Finish: [Match Architect's samples] As selected by Architect from manufacturer's full range.

2.5 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
- C. Installation Adhesive for Foam-Plastic Moldings: Product recommended for indicated use by foam-plastic molding manufacturer.
- D. Paneling Adhesive: Comply with paneling manufacturer's written instructions for adhesives.
- E. Multipurpose Construction Adhesive: Formulation, complying with ASTM D3498, that is recommended for indicated use by adhesive manufacturer.

2.6 FABRICATION

- A. Back out or kerf backs of the following members, except those with ends exposed in finished work:
 1. Interior standing and running trim, except shoe and crown molds.
 2. Wood-board paneling.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.
 - 1. Use concealed shims where necessary for alignment.
 - 2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 - 4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 INSTALLATION OF STANDING AND RUNNING TRIM

- A. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available.
 - 1. Do not use pieces less than 24 inches long, except where necessary.
 - 2. Stagger joints in adjacent and related standing and running trim.
 - 3. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint.
 - 4. Use scarf joints for end-to-end joints.
 - 5. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 - 6. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
 - 7. Install trim after gypsum-board joint finishing operations are completed.
 - 8. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting.
 - 9. Fasten to prevent movement or warping.
 - 10. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 INSTALLATION OF PANELING

- A. Plywood Paneling: Select and arrange panels on each wall to minimize noticeable variations in grain character and color between adjacent panels.
1. Leave 1/4-inch gap to be covered with trim at top, bottom, and openings.
 2. Install with uniform tight joints between panels.
 3. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners.
 4. Space fasteners and adhesive as recommended by panel manufacturer.
 5. Conceal fasteners to greatest practical extent.
 6. Arrange panels with grooves and joints over supports.
 - a. Fasten to supports with nails of type and at spacing recommended by panel manufacturer.
 - b. Use fasteners with prefinished heads matching groove color.
- B. Hardboard Paneling: Install according to manufacturer's written instructions.
1. Leave 1/4-inch gap to be covered with trim at top, bottom, and openings.
 2. Butt adjacent panels with moderate contact.
 3. Use fasteners with prefinished heads matching paneling color.
 4. Wood Stud or Furring Substrate: Install with 1-inch annular-ring shank hardboard nails.
 5. Plaster or Gypsum-Board Substrate: Install with 1-5/8-inch annular-ring shank hardboard nails.
 6. Nailing: Space nails 4 inches o.c. at panel perimeter and 8 inches o.c. at intermediate supports unless otherwise required by manufacturer.
- C. Board Paneling: Install according to manufacturer's written instructions.
1. Arrange in random-width pattern suggested by manufacturer unless boards or planks are of uniform width.
 2. Install in full lengths without end joints.
 3. Stagger end joints in random pattern to uniformly distribute joints on each wall.
 4. Install with uniform end joints with only end-matched (tongue-and-groove) joints within each field of paneling.
 5. Install with uniform end joints. Locate end joints only over furring or blocking.
 6. Select and arrange boards on each wall to minimize noticeable variations in grain character and color between adjacent boards.
 7. Install with uniform tight joints between boards.
 8. Fasten paneling by face nailing, setting nails, and filling over nail heads.
 9. Fasten paneling with trim screws, set below face and filled.
 10. Fasten paneling by blind nailing through tongues.
 11. Fasten paneling with paneling system manufacturer's concealed clips.
 12. Fasten paneling to gypsum wallboard with panel adhesive.

3.6 ADJUSTING

- A. Replace interior finish carpentry that is damaged or does not comply with requirements.
1. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.
- B. Adjust joinery for uniform appearance.

3.7 CLEANING

- A. Clean interior finish carpentry on exposed and semiexposed surfaces.
- B. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.8 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 2023

SECTION 06 4023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Interior standing and running trim.
 2. Closet and utility shelving.
 3. Interior frames and jambs.
 4. Interior stairs and railings.
 5. Wood furring, blocking, shims, and hanging strips for installing interior architectural woodwork items that are not concealed within other construction.
 6. Shop priming of interior architectural woodwork.
 7. Shop finishing of interior architectural woodwork.
- B. Related Requirements:
1. Section 06 1053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing interior architectural woodwork that are concealed within other construction before interior architectural woodwork installation.
 2. Section 06 2023 "Interior Finish Carpentry" for interior carpentry exposed to view that is not specified in this Section.

1.2 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections, to ensure that interior architectural woodwork can be supported and installed as indicated.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
1. Anchors.
 2. Adhesives.
 3. Shop finishing materials.
 4. Wood-Preservative Treatment:
 - a. Include data and warranty information from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
 - b. Indicate type of preservative used and net amount of preservative retained.
 - c. Include chemical-treatment manufacturer's written instructions for finishing treated material and manufacturer's written warranty.

5. Fire-Retardant Treatment: Include data and warranty information from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
6. Waterborne Treatments: For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Shop Drawings:

1. Include the following:
 - a. Dimensioned plans, elevations, and sections.
 - b. Attachment details.
2. Show large-scale details.
3. Show locations and sizes of furring, blocking, and hanging strips, including blocking and reinforcement concealed by construction and specified in other Sections.
4. Apply AWI Quality Certification WI Certified Compliance Program label to Shop Drawings.

C. Samples: For each exposed product and for each shop-applied color and finish specified.

1. Size:
 - a. Panel Products: 12 inches by 12 inches.
 - b. Lumber Products: Not less than 5 inches wide by 12 inches long, for each species and cut, finished on one side and one edge.

D. Samples for Initial Selection: For each type of shop-applied exposed finish.

1. Size:
 - a. Panel Products: 12 inches by 12 inches.
 - b. Lumber Products: Not less than 5 inches wide by 12 inches long, for each species and cut, finished on one side and one edge.

E. Samples for Verification: For the following:

1. Lumber for Transparent Finish: Not less than 5 inches wide by 12 inches long, for each species and cut, finished on one side and one edge.
2. Veneer Leaves: Representative of and selected from flitches to be used for transparent-finished interior architectural woodwork.
3. Lumber and Panel Products with Shop-Applied Opaque Finish: 5 inches wide by 12 inches long for lumber and 12 by 12 inches for panels, for each finish system and color.
 - a. Finish entire exposed surface.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For architectural woodwork manufacturer and Installer.

B. Product Certificates: For the following:

1. Composite wood products.

2. Adhesives.

C. Evaluation Reports: For preservative-treated wood materials, from ICC-ES.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Quality Standard Compliance Certificates: AWI Quality Certification Program WI Certified Compliance Program certificates.

1.7 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1. Manufacturer's Certification: Licensed participant in WI's Certified Compliance Program.
2. Installer Qualifications: Manufacturer of products Licensed participant in WI's Certified Compliance Program.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Architectural Woodwork Standards, Section 2.

B. Do not deliver interior architectural woodwork until painting and similar finish operations that might damage woodwork have been completed in installation areas.

C. Store woodwork in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1. Handle and store fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions.

1.9 FIELD CONDITIONS

A. Environmental Limitations without Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of the construction period.

B. Environmental Limitations with Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

C. Field Measurements: Where interior architectural woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being concealed by construction, and indicate measurements on Shop Drawings.
- D. Established Dimensions: Where interior architectural woodwork is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.10 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Frames: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
 1. Smoke- and Draft-Control Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing in accordance with NFPA 257 or UL 9.

2.2 ARCHITECTURAL WOODWORK, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 1. Provide certificates from AWI WI certification program indicating that woodwork and installation complies with requirements of grades specified.
 2. The Contract Documents contain requirements that are more stringent than the Architectural Woodwork Standards. Comply with Contract Documents and Architectural Woodwork Standards.

2.3 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

- A. Architectural Woodwork Standards Grade: Premium.
- B. Hardwood Lumber:

1. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.
2. Species: White oak.
3. Cut: Plain sliced/plain sawn.
4. Wood Moisture Content: 5 to 10 percent.
5. Provide split species on trim that faces areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.
6. For trim items wider than available lumber, use veneered construction. Do not glue for width.
 - a. For veneered base, use hardwood lumber core, glued for width.
7. For base wider than available lumber, glue for width. Do not use veneered construction.
8. For rails thicker than available lumber, use veneered construction. Do not glue for thickness.

C. Softwood Lumber:

1. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.
2. Species: Western white pine Douglas fir.
3. Cut: Plain sawn.
4. Wood Moisture Content: 5 to 10 percent.
5. Provide split species on trim that faces areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.
6. For trim items wider than available lumber, use veneered construction. Do not glue for width.
 - a. For veneered base, use softwood lumber core, glued for width.
7. For base wider than available lumber, glue for width. Do not use veneered construction.
8. For rails thicker than available lumber, use veneered construction. Do not glue for thickness.
9. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.

2.4 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

- A. Architectural Woodwork Standards Grade: Premium.
1. Wood Species: Any closed-grain hardwood.
 2. Wood Moisture Content: 5 to 10 percent.

2.5 INTERIOR FRAMES AND JAMBS FOR TRANSPARENT FINISH

- A. Architectural Woodwork Standards Grade: Premium.
- B. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.
1. Species: White oak.

2. Cut: Plain sliced/plain sawn.
 3. Wood Moisture Content: 5 to 10 percent.
 4. Provide split species on frames and jambs that face areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.
- C. For frames or jambs wider than available lumber, use veneered construction. Do not glue for width.
1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
- D. Fire-Rated Interior Frames and Jambs: Products fabricated from fire-retardant particleboard or fire-retardant MDF with veneered exposed surfaces and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing in accordance with NFPA 252.
1. Fire Rating: 20 minutes.

2.6 INTERIOR FRAMES AND JAMBS FOR OPAQUE FINISH

- A. Architectural Woodwork Standards Grade: Premium.
- B. Wood Species: Any closed-grain hardwood.
1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
 2. Wood Moisture Content: 5 to 10 percent.
- C. Fire-Rated Interior Frames and Jambs: Products fabricated from fire-retardant particleboard with veneered exposed surfaces or fire-retardant MDF and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing in accordance with NFPA 252.
1. Fire Rating: 20 minutes.

2.7 HARDWOOD SHEET MATERIALS

- A. Composite Wood Products: Provide materials that comply with requirements of the Architectural Woodwork Standards for each type of interior architectural woodwork and quality grade specified unless otherwise indicated.
1. Softwood Plywood: DOC PS 1, medium-density overlay.
 2. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.

2.8 FIRE-RETARDANT-TREATED WOOD MATERIALS

- A. Fire-Retardant-Treated Wood Materials: Where fire-retardant-treated materials are indicated, use materials complying with requirements that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products in accordance with test method indicated by a qualified testing agency.

1. Use treated materials that comply with requirements of the Architectural Woodwork Standards. Do not use materials that are warped, discolored, or otherwise defective.
 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.
- B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested in accordance with ASTM E84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
1. Kiln-dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
 2. For items indicated to receive a stained, transparent, or natural finish, use organic resin chemical formulation.
 3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking shop certified by testing and inspecting agency.
 4. Mill lumber before treatment, and implement procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

2.9 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Nailers: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
1. Preservative Treatment: Provide softwood lumber treated by pressure process, AWPA U1; Use Category UC3b.
 - a. Provide where in contact with concrete or masonry.
 - b. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
 - c. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - d. Mark lumber with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee's (ALSC) Board of Review.
 2. Fire-Retardant Treatment: Complying with requirements; provide where indicated.
- B. Provide self-drilling screws for metal-framing supports, as recommended by metal-framing manufacturer.
- C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.
1. Provide metal expansion sleeves or expansion bolts for post-installed anchors.
 2. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

- D. Installation Adhesive: Product recommended by fabricator for each substrate for secure anchorage.

2.10 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate interior architectural woodwork to dimensions, profiles, and details indicated.
 - 1. Ease edges to radius indicated for the following:
 - a. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
 - b. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
- C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site.
 - 1. Disassemble components only as necessary for shipment and installation.
 - 2. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.
 - 3. Notify Architect seven days in advance of the dates and times interior architectural woodwork fabrication will be complete.
 - 4. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled.
 - a. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting.
 - b. Verify that parts fit as intended, and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling for shipment.

2.11 SHOP PRIMING

- A. Preparations for Finishing: Comply with the Architectural Woodwork Standards for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work.
- B. Interior Architectural Woodwork for Opaque Finish: Shop prime with one coat of wood primer as specified in Section 09 9123 "Interior Painting."
 - 1. Backpriming: Apply one coat of primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to surfaces installed in contact with concrete or masonry and to end-grain surfaces.
- C. Interior Architectural Woodwork for Transparent Finish: Shop-seal concealed surfaces with required pretreatments and first coat of finish as specified in Section 09 9300 "Staining and Transparent Finishing."
 - 1. Backpriming: Apply one coat of sealer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to surfaces installed in contact with concrete or masonry and to end-grain surfaces.

2.12 SHOP FINISHING

- A. Finish interior architectural woodwork with transparent finish at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with Architectural Woodwork Standards, Section 5 for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of interior architectural woodwork. Apply two coats to end-grain surfaces.
- C. Transparent Finish:
 - 1. Architectural Woodwork Standards Grade: Premium.
 - 2. Finish System - 10: UV Curable, Water Based.
 - 3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
 - 4. Staining: Match approved sample for color.
 - 5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
 - 6. Filled Finish for Open-Grain Woods: After staining, apply wash-coat sealer and allow to dry. Apply paste wood filler and wipe off excess. Tint filler to match stained wood.
 - 7. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter in accordance with ASTM D523.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition interior architectural woodwork to humidity conditions in installation areas for not less than 72 hours prior to beginning of installation.
- B. Before installing interior architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming of concealed surfaces.

3.2 INSTALLATION

- A. Grade: Install interior architectural woodwork to comply with same grade as item to be installed.
- B. Assemble interior architectural woodwork and complete fabrication at Project site to the extent that it was not completed during shop fabrication.
- C. Install interior architectural woodwork level, plumb, true in line, and without distortion.
 - 1. Shim as required with concealed shims.
 - 2. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut interior architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

- E. Preservative-Treated Wood: Where cut or drilled in field, treat cut ends and drilled holes in accordance with AWPA M4.
- F. Fire-Retardant-Treated Wood: Install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
- G. Anchor interior architectural woodwork to anchors or blocking built in or directly attached to substrates.
 - 1. Secure with countersunk, concealed fasteners and blind nailing.
 - 2. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with interior architectural woodwork.
 - 3. For shop-finished items, use filler matching finish of items being installed.
- H. Standing and Running Trim:
 - 1. Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible.
 - 2. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary.
 - 3. Scarf running joints and stagger in adjacent and related members.
 - 4. Fill gaps, if any, between top of base and wall with plastic wood filler; sand smooth; and finish same as wood base if finished.
 - 5. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

3.3 FIELD QUALITY CONTROL

- A. Inspections: Provide inspection of installed Work through AWI's Quality Certification Program WI's Certified Compliance Program certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.
 - 1. Inspection entity shall prepare and submit report of inspection.

3.4 REPAIR

- A. Repair damaged and defective interior architectural woodwork, where possible, to eliminate functional and visual defects and to result in interior architectural woodwork being in compliance with requirements of Architectural Woodwork Standards for the specified grade.
- B. Where not possible to repair, replace defective woodwork.
- C. Shop Finish: Touch up finishing work specified in this Section after installation of interior architectural woodwork.
 - 1. Fill nail holes with matching filler where exposed.
 - 2. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.
- D. Field Finish: See Section 09 9123 "Interior Painting" and Section 09 9300 "Staining and Transparent Finishing" for final finishing of installed interior architectural woodwork not indicated to be shop finished.

3.5 CLEANING

- A. Clean interior architectural woodwork on exposed and semiexposed surfaces.

END OF SECTION 06 4023

3.3 FIELD QUALITY CONTROL

- A. Inspections: Provide inspection of installed Work through [AWI's Quality Certification Program] [WI's Certified Compliance Program] certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.
 - 1. Inspection entity shall prepare and submit report of inspection.

3.4 REPAIR

- A. Repair damaged and defective interior architectural woodwork, where possible, to eliminate functional and visual defects[and to result in interior architectural woodwork being in compliance with requirements of Architectural Woodwork Standards for the specified grade].
- B. Where not possible to repair, replace defective woodwork.
- C. Shop Finish: Touch up finishing work specified in this Section after installation of interior architectural woodwork.
 - 1. Fill nail holes with matching filler where exposed.
 - 2. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.
- D. Field Finish: See [Section 09 9123 "Interior Painting"] [and_] [Section 09 9300 "Staining and Transparent Finishing"] for final finishing of installed interior architectural woodwork not indicated to be shop finished.

3.5 CLEANING

- A. Clean interior architectural woodwork on exposed and semiexposed surfaces.

END OF SECTION 06 4023

SECTION 06 6400 - PLASTIC PANELING

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. Plastic sheet paneling.
 - 2. Factory-laminated plastic sheet paneling.
- B. Related Requirements:
 - 1. Section 06 1000 "Rough Carpentry" for wood furring for installing plastic paneling.
 - 2. Section 06 4219 "Plastic-Laminate-Faced Wood Paneling."
 - 3. Section 10 2600 "Wall and Door Protection" for corner guards installed over plastic paneling.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.4 QUALITY ASSURANCE

- A. Testing Agency: Acceptable to authorities having jurisdiction.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

2.2 PLASTIC SHEET PANELING

- A. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D5319.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Composites, Inc.
 - b. Marlite, Inc.
 - c. Nudo.
 2. Products with flame-spread index of 25 or less are readily available and are usually designated Class A. Most other products have flame-spread index of 200 or less and are designated Class C.
 3. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E84. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 4. Nominal Thickness: Not less than 0.09 inch.
 5. Surface Finish: As selected by Architect from manufacturer's full range.
 6. Color: As selected by Architect from manufacturer's full range.

2.3 ACCESSORIES

- A. Trim Accessories: Manufacturer's standard one-piece or two-piece, snap-on vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.
1. Color: Match panels.
- B. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.
- C. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.
- D. Adhesive: As recommended by plastic paneling manufacturer.
- E. Sealant: Mildew-resistant, single-component, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 07 9200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove wallpaper, vinyl wall covering, loose or soluble paint, and other materials that might interfere with adhesive bond.
- B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.
- C. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.
- D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.
- E. Lay out paneling before installing. Locate panel joints where indicated to provide equal panels at ends of walls not less than half the width of full panels so that trimmed panels at corners are not less than 12 inches wide.
 - 1. Mark plumb lines on substrate at panel joint locations for accurate installation.
 - 2. Locate panel joints to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

- A. Install plastic paneling according to manufacturer's written instructions.
- B. Install panels in a full spread of adhesive.
- C. Install panels with fasteners. Layout fastener locations and mark on face of panels so that fasteners are accurately aligned.
 - 1. Drill oversized fastener holes in panels and center fasteners in holes.
 - 2. Apply sealant to fastener holes before installing fasteners.
- D. Install factory-laminated panels using concealed mounting splines in panel joints.
- E. Install trim accessories with adhesive and nails or staples.
- F. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.
- G. Maintain uniform space between panels and wall fixtures. Fill space with sealant.
- H. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant.
- I. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 06 6400

SECTION 07 2116

PRE-ENGINEERED BUILDING BLANKET INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Provide insulation system for pre-engineered metal buildings – new construction and existing construction.
- B. Related Sections:
 - 1. Division 21 - Fire Suppression
 - 2. Division 23 - HVAC; Rough-in utilities.
 - 3. Division 26 - Electrical; Rough-in utilities.

1.2 REFERENCES

- A. Materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use:
 - 1. American Society for Testing of Materials (ASTM):
 - a. ASTM C991 - Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings.
 - b. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
 - c. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - d. ASTM E 96 - Standard Test Method for Water Vapor Transmission of Materials in Sheet Form (Procedure A).
 - 2. North American Insulation Manufacturers Association (NAIMA):
 - a. NAIMA 202-96(R) (Rev. 2000) STANDARD For Flexible Fiberglass Insulation to be Laminated for Use in Metal Buildings
 - 3. National Fire Protection Association (NFPA):
 - a. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
 - 4. Underwriters Laboratories (UL):
 - a. UL 723 - Test for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

- A. Product Data: Provide manufacturer's data for each of the following including:

1. Liner installation instructions
2. Product data sheet
3. Design considerations guide
4. Recycle content certification for fiberglass insulation products – minimum 50% recycled content for all fiberglass insulation materials.

B. Shop Drawings: Provide shop drawings that indicate the following:

1. Liner fabric layout
2. Customer and project information

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Companies shall be familiar with the installation practices associated with banded liner systems.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products indoors or in a dry, covered area.
- B. Do not open products until ready to use.
- C. Protect products from potential construction site damage.
- D. Use care when opening products as pallets may shift during shipment.
- E. Banding has sharp edges. Wear cut proof gloves when handling.
- F. Wear safety glasses when unpacking materials.

1.6 PROJECT CONDITIONS

A. For best results, do not install this system outside of the temperature, humidity, ventilation and environmental limits recommended by the manufacturer. Products should be kept covered and dry at temperatures less than 100°F prior to installation.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Owens Corning Insulating Systems, LLC, Toledo, OH 43659; www.owenscorning.com.

2.2 MATERIALS

1. Fabric liner facing/vapor barrier composed of woven high-density polyethylene coated on both sides with polyethylene. Complies with the following:
 - a. ASTM C1136, Types I through Type VI

- 1) Type I-IV exception for dimensional stability (value is < 2.0%.)
 - b. Perm rating: ≤ 0.02 when tested in accordance with ASTM E 96 Procedure A.
 - c. Flame Spread Index < 25 and Smoke Developed Index < 50 when tested in accordance with ASTM E 84.
 - d. Color:
 - 1) White
2. Vapor barrier adhesive. Complies with the following:
 - a. Application temperature 10°F to 110° F
3. Double sided vapor barrier tape. Complies with the following:
 - a. Width 0.75"
 - b. Rubber based and free film
4. Patch tape. Complies with the following:
 - a. Adhesive added to one side
 - b. Installation temperature from 10°F to 110°F
 - c. 3" width
5. Metal Banding/Straps. Complies with the following:
 - a. Coated steel
 - b. 1.0" wide
 - c. Structural Steel Grade 50 per ASTM C 653
 - d. Exposed color to match vapor barrier
 - 1) White
 - e. Backing – gray

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the areas and conditions under which work of this section will be installed. Verify that adjacent materials are dry and ready to receive insulation. Verify structure, bracing, and concealed building systems have been tested and inspected.
- B. Provide written report listing conditions detrimental to performance of work in this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install liner system in accordance with manufacturer's installation instructions and approved Shop Drawings.

- B. Purlin and girt attachment surfaces should be clean and dry prior to attaching two-faced tape or sealing adhesive.
- C. Installed fiberglass insulation should fit snugly against purlin and girt walls in the cavity space. Avoid gaps, voids and any excess compression.

3.3 CLEANING

- A. Clean dirt from vapor barrier fabric using a soft cloth with soap and water or non-abrasive household cleaner. Solvent-based cleaners and abrasive pads should be avoided.

3.4 SAFETY PRECAUTIONS

- A. Installation contractor must have a site-specific safety plan and comply with all OSHA applicable local rules and regulations when installing this system.
- B. Workers must use OSHA required fall protection when installing the banded liner system at heights (see OSHA regulations at 29 CFR 1926, Subpart M).
- C. Banding has sharp edges and cut proof gloves should be worn when handling.

3.5 APPENDIX

- A. Refer to the Owens Corning publications listed below for product information, including uses, descriptions, physical properties, performance, specification compliance and application recommendations. Copies of these documents can be found at www.owenscorning.com.
 1. OptiLiner® Banded Liner System Product Data Sheet – Owens Corning Publication 10011681
 2. OptiLiner® Roof Installation Instructions – Owens Corning Publication 10011267
 3. OptiLiner® Bi-Directional Banding Option – Owens Corning Publication 10011602

END OF SECTION

SECTION 08 1113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Interior standard steel doors and frames.
 - 2. Exterior standard steel doors and frames.
 - 3. Interior custom hollow-metal doors and frames.
 - 4. Exterior custom hollow-metal doors and frames.
- B. Related Requirements:
 - 1. Section 08 1119 "Stainless-Steel Doors and Frames" for hollow-metal doors and frames manufactured from stainless steel.
 - 2. Section 08 3463 "Detention Doors and Frames" for hollow-metal doors and frames for detention facilities.
 - 3. Section 08 3473.13 "Metal Sound Control Door Assemblies" for packaged, acoustically rated hollow-metal door and frame assemblies.
 - 4. Section 08 7100 "Door Hardware" for door hardware for hollow-metal doors.
 - 5. Section 13 4900 "Radiation Protection" for lead-lined, hollow-metal doors and frames.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, and finishes.
- B. Sustainable Design Submittals:
- C. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
 - 7. Details of anchorages, joints, field splices, and connections.
 - 8. Details of accessories.
 - 9. Details of moldings, removable stops, and glazing.
- D. Samples for Initial Selection: For hollow-metal doors and frames with factory-applied color finishes.
- E. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For door inspector.
 - 1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
 - 2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
 - 3. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.
- B. Product Test Reports: For each type of [fire-rated hollow-metal door and frame assembly] [fire-rated borrowed-lite assembly] [windborne-debris impact resistance door] [and] [thermally rated door assemblies] for tests performed by a qualified testing agency indicating compliance with performance requirements.
- C. Oversize Construction Certification: For assemblies required to be fire-rated and exceeding limitations of labeled assemblies.
- D. Field quality control reports.

1.8 CLOSEOUT SUBMITTALS

- A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.9 QUALITY ASSURANCE

- A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:
 - 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAl) certification.
- B. Egress Door Inspector Qualifications: Inspector for field quality control inspections of egress door assemblies shall meet the qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
 - 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAl) certification.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ceco Door; AADG, Inc.; ASSA ABLOY.
 - 2. Curries, AADG, Inc.; ASSA ABLOY Group.
 - 3. DKS Steel Door & Frame Systems, Inc.
 - 4. Republic Doors and Frames; a Allegion brand.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
- B. Fire-Rated, Borrowed-Lite Assemblies: Assemblies complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A..
1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated steel sheet, minimum thickness of 0.053 inch.
 - d. Edge Construction: Model 2, Seamless.
 - e. Edge Bevel: Bevel lock and hinge edges 1/8 inch in 2 inches.
 - f. Core: Manufacturer's standard.
 - g. Fire-Rated Core: Manufacturer's standard core for fire-rateddoors.
 2. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch.
 - b. Construction: Full profile welded.
 3. Exposed Finish: Prime.

2.4 HOLLOW-METAL PANELS

- A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
 3. Postinstalled Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

- C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.
- D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.6 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.
- E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- F. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.
- G. Glazing: Comply with requirements in Section 08 8000 "Glazing."

2.7 FABRICATION

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
 - 1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 2. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with miteredhairline joints.
1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
 5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
- B. Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, complying with ANSI/SDI A250.3.
1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with ANSI/SDI A250.11.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 2. Fire-Rated Openings: Install frames according to NFPA 80.
 3. Floor Anchors: Secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 4. Solidly pack mineral-fiber insulation inside frames.
 5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 08 8000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
 1. Fire-Rated Door Inspections: Inspect each fire-rated door according to NFPA 80, Section 5.2.
 2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements according to NFPA 101, Section 7.2.1.15.

- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 101.

3.4 REPAIR

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- C. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.
- D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 1113

SECTION 08 1416 - FLUSH WOOD DOORS

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. Five-ply flush wood doors and transom panels for opaque finish.
 - 2. Factory priming & finishing flush wood doors and frames.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Requirements:
 - 1. Section 08 3473.16 "Wood Sound Control Door Assemblies" for acoustic flush wood doors.
 - 2. Section 08 8000 "Glazing" for glass view panels in flush wood doors.
 - 3. Section 09 9123 "Interior Painting" and for field finishing doors.
 - 4. Section 13 4900 "Radiation Protection" for lead-lined flush wood doors.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, including the following:
 - 1. Door core materials and construction.
 - 2. Door edge construction
 - 3. Door face type and characteristics.
 - 4. Door louvers.
 - 5. Door trim for openings.
 - 6. Door frame construction.
 - 7. Factory-machining criteria.
 - 8. Factory-priming & finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:
 - 1. Door schedule indicating door and frame location, type, size, fire protection rating, and swing.
 - 2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
 - 3. Details of frame for each frame type, including dimensions and profile.

4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
 5. Dimensions and locations of blocking for hardware attachment.
 6. Dimensions and locations of mortises and holes for hardware.
 7. Clearances and undercuts.
 8. Requirements for veneer matching.
 9. Doors to be factory primed for opaque finish and application requirements.
- C. Samples for Initial Selection: For factory-finished doors and factory-finished door frames.
- D. Samples for Verification:
1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.
 2. Plastic laminate, 6 inches square, for each color, texture, and pattern selected.
 3. Polymer edging, in manufacturer's standard colors.
 4. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
 5. Louver blade and frame sections, 6 inches long, for each material and finish specified.
 6. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For door inspector.
1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
 2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
 3. Submit copy of DHI's Fire and Egress Door Assembly Inspector (FDAI) certificate.
- B. Field quality-control reports.
- C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Special warranties.
- B. Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.
- C. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.7 QUALITY ASSURANCE

- A. Manufacturer's Certification: Licensed participant in WI's Certified Compliance Program.
- B. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies shall comply with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:

1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.
- C. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies shall comply with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
 1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.
- B. Environmental Limitations: Do not deliver or install doors until building is enclosed and weathertight, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors and frames that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Delamination of veneer.
 - b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors and frames.
 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Wood Door and Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with UL 10C or NFPA 252.
- B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

2.3 FLUSH WOOD DOORS AND FRAMES, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI/AWMAC/WI's "Architectural Woodwork Standards." ANSI/WDMA I.S. 1A.
 - 1. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with the Contract Documents in addition to those of the referenced quality standard.

2.4 SOLID-CORE FIVE-PLY FLUSH WOOD DOORS AND TRANSOM PANELS FOR OPAQUE FINISH

- A. Interior Solid-Core Doors:
 - 1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. [Oshkosh Door Company](#).
 - b. [VT Industries Inc.](#)
 - c. Haley Architectural Doors
 - 2. Performance Grade: ANSI/WDMA I.S. 1A Extra Heavy Duty.
 - 3. Faces: MDO.
 - a. Apply MDO to standard-thickness, closed-grain, hardwood face veneers.
 - b. Hardboard Faces: ANSI A135.4, Class 1 (tempered) or Class 2 (standard).
 - c. MDF Faces: ANSI A208.2, Grade 150 or Grade 160.
 - 4. Exposed Vertical and Top Edges: Any closed-grain hardwood.
 - 5. Core for Non-Fire-Rated Doors:
 - a. ANSI A208.1, Grade LD-1 particleboard.
 - 1) Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
 - a) 5-inch top-rail blocking, in doors indicated to have closers.
 - 2) Provide doors with glued-wood-stave or WDMA I.S. 10 structural-composite-lumber cores instead of particleboard cores for doors scheduled to receive exit devices in Section 08 7100 "Door Hardware."

- b. Glued wood stave.
 - c. WDMA I.S. 10 structural composite lumber.
 - 1) Screw Withdrawal, Door Face: 550 lbf.
 - 2) Screw Withdrawal, Vertical Door Edge: 550 lbf.
 - d. Either glued wood stave or WDMA I.S. 10 structural composite lumber.
6. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.
- a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings.
 - 1) 5-inch top-rail blocking.
 - 2) 5-inch bottom-rail blocking, in doors indicated to have protection plates.
 - 3) 5-inch midrail blocking, in doors indicated to have armor plates.
 - 4) 5-inch midrail blocking, in doors indicated to have exit devices.
7. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.5 FIRE-RATED WOOD DOOR FRAMES

- A. Interior Frames:
- 1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. **Masonite Architectural.**
 - b. **Oshkosh Door Company.**
 - 2. Architectural Woodwork Standards Grade Architectural Woodwork Standards Grade: Custom.
 - 3. Wood Species and Cut: Match species and cut indicated for wood doors unless otherwise indicated.
 - 4. Species: Verify in field to match existing.
 - 5. Cut: Plain sliced/plain sawn.
 - 6. Wood Moisture Content: 8 to 13 percent.
 - 7. Profile: Double rabbet.
 - 8. Construction: Solid lumber, fire-retardant particleboard, or fire-retardant medium density fiberboard (MDF) with veneered exposed surfaces and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated on Drawings.

2.6 LIGHT FRAMES AND LOUVERS

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
- 1. Wood Species: Species compatible with door faces.
 - 2. Profile: Flush rectangular beads.
 - 3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

- B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated on Drawings. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

2.7 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated.
 - 1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 2. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied.
 - 1. Locate hardware to comply with DHI-WDHS-3.
 - 2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
 - 3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
 - 4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
 - 5. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Transom and Side Panels:
 - 1. Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors.
 - 2. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
 - 3. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails.
 - 4. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
- D. Openings: Factory cut and trim openings through doors.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 8000 "Glazing."
 - 3. Louvers: Factory install louvers in prepared openings.
- E. Exterior Doors: Factory treat exterior doors with water repellent after fabrication has been completed but before factory priming.
 - 1. Flash top of outswinging doors with manufacturer's standard metal flashing.

2.8 FACTORY PRIMING

- A. Doors for Opaque Finish: Factory prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in Section 09 9123" Interior Painting."

2.9 FACTORY FINISHING

- A. Comply with referenced quality standard for factory finishing.
 - 1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 2. Finish faces, all four edges, edges of cutouts, and mortises.
 - 3. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Factory finish doors that are indicated on Drawings to receive transparent finish.
- D. Factory finish doors where indicated in schedules or on Drawings as factory finished.
- E. Opaque Finish:
 - 1. Finish: Architectural Woodwork Standards System-10, UV Curable, Water Based.
 - 2. Color: As selected by Architect from manufacturer's full range.
 - 3. Sheen: Semigloss.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 08 7100 "Door Hardware."
- B. Install doors and frames to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Install frames level, plumb, true, and straight.
 - 1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
 - 2. Anchor frames to anchors or blocking built in or directly attached to substrates.
 - a. Secure with countersunk, concealed fasteners and blind nailing.
 - b. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - 1) For factory-finished items, use filler matching finish of items being installed.

3. Install fire-rated doors and frames in accordance with NFPA 80.
4. Install smoke- and draft-control doors in accordance with NFPA 105.

D. Job-Fitted Doors:

1. Align and fit doors in frames with uniform clearances and bevels as indicated below.
 - a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.
2. Machine doors for hardware.
3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
4. Clearances:
 - a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
 - b. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
 - c. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - d. Comply with NFPA 80 for fire-rated doors.
5. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
6. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
 1. Provide inspection of installed Work through AWI's Quality Certification Program WI's Certified Compliance Program, certifying that wood doors and frames, including installation, comply with requirements of AWI/AWMCA/WI's "Architectural Woodwork Standards" for the specified grade.
 2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
 3. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 1416

SECTION 08 3400 – SPECIAL FUNCTION DOORS

GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes:
 - 1. Interior Aluminum-Framed Top-Hung Sliding Doors
- B. Related Sections:
 - 1. Section 08 1416 – Flush Wood Doors
 - 2. Section 08 1316 – Aluminum Doors

1.03 REFERENCES

- A. ANSI – American National Standards Institute
 - 1. ANSI 156.18 Materials and Finishes
 - 2. ANSI A117.1 Specifications for making buildings and facilities usable by physically handicapped people.
- B. BHMA – Builders Hardware Manufacturers Association
- C. DHI – Door and Hardware Institute
- D. NFPA – National Fire Protection Association
 - 1. NFPA 80 – Fire Doors and Windows
 - 2. NFPA 101 – Life Safety code
 - 3. NFPA 105 – Smoke and Draft Control Door Assemblies
 - 4. NFPA 252 – Fire Tests of Doors Assemblies
- E. AWS – Architectural Woodwork Standards

1.04 SUBMITTALS

- A. Comply with Section 01 3300 – Submittal Procedures
- B. Product Data: Submit manufacturer's product data, including installation instructions.
- C. Shop Drawings: Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating dimensions, tolerances, materials, components, hardware, finish, options, and accessories. Shop Drawings to show required blocking by others.

- D. Samples: Submit manufacturer's samples of the following sliding door components:
 - 1. Door veneer or laminate sample.
 - 2. Aluminum Frame finish sample.
- E. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
- F. Warranty Documentation: Submit manufacturer's standard warranty.
- G. Test Reports: Submit acoustical reports or UL1784 as applicable.

1.05 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of interior aluminum frames and doors.
- B. Source: Obtain sliding aluminum framed doors and hardware from single source.
- C. Manufacturer's Qualifications: Manufacturer regularly engaged for past 5 years in manufacture of sliding doors similar to that specified.

1.06 PERFORMANCE

- A. Aluminum perimeter frames with integral acoustic seals at all door/frame interfaces
 - 1. Architect to verify frame thickness suitable for required application
- B. Soft-closing mechanism at both sides of door integrated with top track. Soft Closers tested to a minimum of 150,000 cycles.
- C. Concealed door guide.
- D. Manufacturer to 3rd party acoustical performance test data
- E. Manufacturer to submit 3rd party test data on air infiltration and/or smoke ratings as applicable

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Notify manufacturer immediately of any shipping damage.
- C. Storage and Handling Requirements:
 - 1. Store and handle materials in accordance with manufacturer's instructions.
 - 2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
 - 3. Store materials in clean, dry area indoors.
 - 4. Protect materials and finish during storage, handling, and installation to prevent damage.

PRODUCTS

2.01 MANUFACTURERS

- A. **AD SYSTEMS** 2201 100th St. SW, Everett, WA 98204 | Website: <http://specADsystems.com>
| Phone: 425-740-6011 | ADSystems.Estimating@allegion.com

2.02 INTERIOR SLIDING ALUMINUM-FRAMED DOORS AND PARTITIONS

- A. Manufacturer:
1. Scheduled Manufacturer: OfficeSlide™ High Performance Barn (Sliding) Door System by AD Systems.
 2. Acceptable Substitute: No Substitution.
- B. Specified Wall Thickness **5-7/8"**
- C. Frame Profiles: Extruded aluminum frame "wrap" frame with integral vertical jamb (stile pocket).
- D. Finish:
1. Standard: Painted Hardcoat (Kynar) Finish. Meets AAMA 2604 Standard Colors: **Light Sequin 789G048**
- E. Frame Profiles: Extruded aluminum frame "wrap" frame with integral vertical jamb (stile pocket).
1. Profile Dimensions:
 - a. Standard Depth (IM-01) Mullion and Sill (Option A in sample drawings)
 - b. Vertical Mullions (if applicable): no vertical frame, butt glazed
- F. Door Leaves: all Doors to be factory machined for hardware including pilot and function holes.
1. 1-3/4" Flush Wood Door: Reference Spec Section 08 1416 Wood Doors or other section as applicable. **OR OPTION:** Specify: Solid Timber-Strand Core **White Maple Clear CL18**
 - a. Optional Glazing: **tempered glass.**
 - b. Standard stile widths are 6" with a 10" bottom rail.
 2. Other 1-3/4" Doors. Contact AD Systems.
- G. Door Components:
1. Single Top Track: AD Systems extruded aluminum track by AD Systems
 2. Valances: Extruded aluminum with integral end caps
 3. Top Rollers: tandem nylon roller sized to match door weight.
 4. Concealed Floor Guide: Integral Jamb floor guide by AD Systems.
 5. Soft-Closers: Soft-closing dampener mechanism at **both** sides of door leaf. Demonstrate closers as tested to 150k cycles.
 6. Pull Handles:
 - a. AD Systems Standard Ladder Pull: 16" long x 1" diameter. Finish: US32D Satin Stainless Steel.
- H. Door Locks:
1. Deadbolt Lock including 16-inch Ladder Pull.

Finish: US32D Standard

- a. AD5450 Office—Keyed lock deadbolt with cylinder and ADA compliant thumbturn
- I. Optional Accessories. If desired, indicate REQUIRED. If not desired, delete options below.
- J. **REQUIRED:** Automatic Door Bottom for improved acoustical performance
- K. Additional hardware functionality can be accommodated. Please contact AD Systems with your hardware requirements and we evaluate system compatibility and create specification language.

EXECUTION

3.01 EXAMINATION

- A. Examine wall openings to receive sliding doors for plumb, level, and square. Note: Finish door operation will be affected by out of tolerance framing.
- B. Verify dimensions of wall openings.
- C. Examine surfaces to receive top and bottom guide.
- D. Notify Architect of conditions that would adversely affect installation or subsequent use of sliding doors.
- E. Do not begin installation until unacceptable conditions are corrected.
- F. Base of door side to be flush or minimal. Rubber Base acceptable.

3.02 INSTALLATION

- A. Install sliding doors in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Install sliding doors plumb, level, square, and in proper alignment.
- C. Install sliding doors to close against walls without gaps.
- D. Install sliding doors to open and close smoothly.
- E. Anchor sliding doors securely in place to supports. Required: Fire treated 2 x 6 blocking required full length of track.

3.03 ADJUSTING

- A. Adjust sliding doors for proper operation in accordance with manufacturer's instructions.
- B. Adjust sliding doors to operate smoothly without binding.

- C. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.

3.04 CLEANING

- A. Clean sliding doors promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that could damage materials or finish.

3.05 PROTECTION

- A. Protect installed sliding doors from damage during construction.

END OF SECTION

SECTION 08 7100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Mechanical door hardware for the following:
 - a. Swinging doors.
 - b. Sliding doors.
 - 2. Cylinders for door hardware specified in other Sections.
- B. Related Requirements:
 - 1. Section 08 1213 "Hollow Metal Frames".
 - 2. Section 08 1216 "Aluminum Frames" for door silencers provided as part of aluminum frames.
 - 3. Section 08 1416 "Flush Wood Doors" for provided as part of labeled fire-rated assemblies.
 - 4. Section 08 3113 "Access Doors and Frames" for access door hardware, including cylinders.

1.3 COORDINATION

- A. Floor-Recessed Door Hardware: Coordinate layout and installation with floor construction.
 - 1. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

- E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
- A. Conference participants shall include Installer's Architectural Hardware Consultant, Architect, Construction Manager, Contractor, Security Contractor, Hardware Supplier, Installer, Key District Personnel, and Project Inspector.
- B. Keying Conference: Conduct conference at Project site.
 - 1. Conference participants shall include Installer's Architectural Hardware Consultant, Architect, Construction Manager, Contractor, Security Contractor, Hardware Supplier, Installer, Key District Personnel, and Project Inspector.
 - 2. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - a. Flow of traffic and degree of security required.
 - b. Preliminary key system schematic diagram.
 - c. Address for delivery of keys.
 - d. Review District's keying standards.

1.5 ACTION SUBMITTALS & SUBSTITUTIONS

- A. General: Submit in accordance with Conditions of the Contract and Division 01 Specification sections.
- B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- C. Submit six (6) copies of schedule organized vertically into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:
 - 1. Include a Cover Sheet with:
 - a. Job Name, location, telephone number.
 - b. Architects name, location and telephone number.
 - c. Contractors name, location, telephone number and job number.
 - d. Suppliers name, location, telephone number and job number.
 - e. Hardware consultant's name, location and telephone number.
 - 2. Job Index information included:
 - a. Numerical door number index including; door number, hardware heading number and page number.
 - b. Complete keying information (referred to DHI hand-book "Keying Systems and Nomenclature"). Provision should be made in the schedule to provide keying information when available; if it is not available at the time the preliminary schedule is submitted.
 - c. Manufacturers' names and abbreviations for all materials.

- d. Explanation of abbreviations, symbols, and codes used in the schedule.
 - e. Mounting locations for hardware.
 - f. Clarification statements or questions.
 - g. Catalog cuts and manufacturer's technical data and instructions.
3. Vertical schedule format sample:

Heading Number 1 (Hardware group or set number - HW Group #1)				
(a) 1 Single - Door #101 - Corridor 101 to Exterior			(b) 90°	(c) RH
(d) 3'-0" x 7'-0" x 1-3/4" - Wood Door x Hollow Metal Frame - 20 Minute				
(e) 1.	(f) 3 ea	(g) Hinges - (h) 5BB1 4.5 x 4.5 NRP (i) 1/2 TMS	(j) 630	(k) IVE
2.	1 ea	Lockset - ND80P6D x RHO x RH x 10-025 x JTMS	626	SCH
3.	1 ea	Closer - 4040XP x EDA x TBSRT	689	LCN

- a) Single or pair of doors with opening number and location.
- b) Degree of opening.
- c) Hand of door(s).
- d) Door/frame dimensions and material; Label requirements, if any.
- e) Hardware item line # (Optional).
- f) Quantity.
- g) Product description.
- h) Product part number.
- i) Fastenings and other pertinent information.
- j) Hardware finish codes per ANSI/BHMA A156.18.
- k) Manufacturer abbreviation.

- D. Make substitution requests in accordance with Division 01. Substitution requests must be made prior to bid date. Include product data and indicate benefit to the project. Furnish samples of any proposed substitution.
- E. Wiring Diagrams: Provide product data and wiring and riser diagrams for all electrical products listed in the Hardware Schedule portion of this section.
- F. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.
- G. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- H. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, wiring/riser diagrams, manufacturers' installation and adjustment and maintenance information.
- I. Fire Door Assembly Testing: Submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.
- J. LEED Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification; coordinate and cooperate with Owner and Architect in providing information necessary for required LEED rating.

- K. Qualification Data: For Installer and Architectural Hardware Consultant.
- L. Product Certificates: For each type of electrified door hardware.
 - 1. Certify that door hardware for use on each type and size of labeled fire-rated doors complies with listed fire-rated door assemblies.
- M. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- N. Field quality-control reports.
- O. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals.
- B. Schedules: Final door hardware and keying schedule.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Door Hardware: <Insert detailed descriptions and specific numbers of units>.
 - 2. Electrical Parts: <Insert detailed descriptions and specific numbers of units>.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.
 - 1. Warehousing Facilities: In Project's vicinity.
 - 2. Scheduling Responsibility: Preparation of door hardware and keying schedule.
 - 3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as an Architectural Hardware Consultant (AHC).

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- D. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Provide warranties of respective manufacturer's regular terms of sale from day of final acceptance as follows:
 - 1. Locksets: Ten (10) years.
 - 2. Closers: Thirty (30) years.
 - 3. Automatic Operators: Two (2) years.
 - 4. Exit devices: Three (3) years.
 - 5. Electronic: One (1) year.
 - 6. All other hardware: Two (2) years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

<u>Item</u>	<u>Manufacturer</u>	<u>Acceptable Substitutes</u>
Hinges	Ives	Hager, Stanley, McKinney
Locks, Latches & Cylinders	Schlage	None – District Standard
Exit Devices	Von Duprin	None – District Standard
Closers	LCN	None – District Standard
Push, Pulls & Protection Plates	Ives	Trimco, BBW, DCI
Flush Bolts	Ives	Trimco, BBW, DCI
Coordinators	Ives	Trimco, BBW, DCI
Door Stops	Ives	Trimco, BBW, DCI
Overhead Stops	Glynn-Johnson	Or Approved Equal
Thresholds	Zero	Pemko, National Guard
Seals & Bottoms	Zero	Pemko, National Guard
Operating Trim	Allegion	

2.2 MATERIALS

- A. Hinges:
1. Provide hinges conforming to ANSI/BHMA A156.1.
 2. Hinges shall be sized in accordance with the following:
 - a. Height:
 - 1) Doors up to 42" wide: 4-1/2 inches.
 - 2) Doors 43" to 48" wide: 5 inches.
 - b. Width: Sufficient to clear frame and trim when door swings 180 degrees.
 - c. Number of Hinges: Provide 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.
 3. Exterior out-swinging hinges shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.
 4. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.
 5. Provide hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component.
- B. Continuous Hinges:
1. Provide aluminum geared continuous hinges fabricated from 6063-T6 aluminum conforming to ANSI/BHMA A156.26, Grade 1.
 2. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
 3. Provide continuous hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
 4. Provide continuous hinges 1" shorter in length than nominal height of door, unless otherwise noted, with symmetrical hole pattern.
 5. On fire-rated doors, provide continuous hinges that are UL listed for use on fire-rated doors.
 6. Install continuous hinges with fasteners supplied by manufacturer.
- C. Heavy Duty Cylindrical Locks and Latches: Schlage "ND" Series as scheduled with "Rhodes" lever design.
1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3 hour fire doors.
 2. Provide cylindrical locksets exceeding the ANSI/BHMA A156.2 Grade 1 performance standards for strength, security, and durability in the categories below:
 - a. Abusive locked lever torque – minimum 3,100 inch-pounds without gaining access.
 - b. Offset lever pull – minimum 1,600 foot pounds without gaining access.
 - c. Vertical lever impact – minimum 100 impacts without gaining access.
 - d. Cycle Test – tested to minimum 16 million cycles with no visible lever sag; without the use of performance aids such as set screws or spacers.
 3. Cylinders: Refer to "KEYING" article, herein.
 4. Provide locks with standard 2-3/4" backset, unless noted otherwise, with 1/2" latch throw. Provide proper latch throw for UL listing at pairs.
 5. Provide locksets with separate solid steel anti-rotation thru-bolts, and no exposed screws.
 6. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
 7. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
 8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
 9. Provide levers with vandal resistant technology as scheduled for use at abusive applications.

- D. Heavy Duty Mortise Locks and Latches: Schlage "L" Series as scheduled with "06" style lever and "A" style rose.
1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3 hour fire doors.
 2. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
 3. Provide lock case that is multi-function and field reversible for handing without opening case.
 4. Provide locks with standard 2-3/4" backset with full 3/4" throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1" throw, constructed of stainless steel.
 5. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
 6. Cylinders: Refer to "KEYING" article, herein.
 7. Indicators: Where specified, provide indicator above cylinder or emergency release for visibility while operating the lock that identifies an occupied/unoccupied status of the lock or latch.
 8. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
 9. Provide levers with vandal resistant technology as scheduled for use at abusive applications.
- E. Exit devices: Von Duprin 99 Series as scheduled.
1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
 2. Provide certificate by independent testing laboratory that device has completed over 1,000,000 cycles and can still meet ANSI/BHMA A156.3 standards.
 3. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
 4. Provide exit devices cut to door width and height. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
 5. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
 6. Provide flush end caps for exit devices.
 7. Exit devices shall comply with CBC Section 11B-404.2.7 and shall be mounted between 34" and 44" above the finished floor surface.
 8. Provide exit devices UL certified to meet 5 lbs. maximum unlatching force requirements according to the CBC Section 11B-309.4.
 9. Cylinders: Refer to "KEYING" article, herein.
 10. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
 11. Provide cylinder dogging indicators (CDSI) for visible indication of dogging status as specified.
 12. Removable Mullions: Provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
 13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
 14. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
 15. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.
 16. Provide exit devices with manufacturer's approved strikes.
 17. Provide electrified options as scheduled.
- F. Closers: LCN 4040XP Series as scheduled.
1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.

2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
 3. Provide certificate by independent testing laboratory that door closers have completed over 10,000,000 cycles and can still meet ANSI/BHMA A156.4 standards.
 4. Cylinder Body: 1-1/2" diameter with 3/4" diameter double heat-treated pinion journal.
 5. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120° F to -30° F.
 6. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
 7. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
 8. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
 9. Pressure Relief Valve (PRV) Technology: Not permitted.
 10. Provide door closers powder coated to match balance of door hardware. Powder coating finish shall be certified to exceed 100 hours salt spray testing as described in ANSI/BHMA A156.4 and ASTM B117.
 11. Provide special rust inhibitor (SRI) in highly corrosive areas, and where noted in hardware sets.
 12. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
- G. Electro Mechanical Automatic Operators: LCN Senior Swing as scheduled.
1. Provide low energy automatic operator units that are electro-mechanical design complying with ANSI/BHMA A156.19.
 2. Opening: Powered by DC motor working through reduction gears.
 3. Closing: Spring force.
 4. Manual, hydraulic, or chain drive closers: Not permitted.
 5. Operation: Motor is off when door is in closing mode. Door can be manually operated with power on or off without damage to operator. Provide variable adjustments, including opening and closing speed adjustment.
 6. Cover: Aluminum.
 7. Provide units with manual off/auto/hold-open switch, push and go function to activate power operator, vestibule interface delay, electric lock delay, hold-open delay adjustable from 2 to 30 seconds, and logic terminal to interface with accessories, mats, and sensors.
 8. Provide drop plates, brackets, or adapters for arms as required to suit details.
 9. Provide hard-wired motion sensors and/or actuator switches for operation as specified. Provide weather-resistant actuators at exterior applications.
 10. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
 11. Provide caution signs as described in ANSI/BHMA A156.19.
- H. Flush Bolts & Dust Proof Strikes:
1. Automatic flush bolts shall be of the low operating force design.
 2. Provide top bolt only model for interior doors where applicable and as permitted by testing procedures.
 3. Provide dust proof strikes at openings using bottom bolts.
 4. Manual flush bolts shall only be permitted on storage or mechanical openings, as scheduled.
- I. Door Stops:

2. Kick plates shall be sized 10" high and 2" less door width (LDW) at single doors and 10" high and 1" LDW at pairs or doors.
 3. Provide mop and armor plates with sizes as scheduled in hardware sets.
- K. Thresholds: As scheduled and per details.
1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope. Thresholds shall comply with CBC Section 11B-404.2.5.
 2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 07 "Thermal and Moisture Protection".
 3. Use 1/4" fasteners, red-head flat-head sleeve anchors (SS/FHSL).
- L. Seals: Provide silicone gasket at all rated and exterior doors.
1. Fire-rated Doors, Resilient Seals: UL10C Classified complies with NFPA 80 & NFPA 252. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.
 2. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C Classified complies with NFPA 80 & NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.
 3. Smoke & Draft Control Doors: Provide UL10C Classified complies with NFPA 80 & NFPA 252 for use on "S" labeled Positive Pressure door assemblies.
- M. Door Shoes & Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.
- N. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.3 KEYING

- A. Furnish a Proprietary Schlage masterkey system as directed by the Peralta Community College District. Key system to be designated and combined by the Schlage Master Key Department even if pinned by the Authorized Key Center, Authorized Security Center or a local authorized commercial dealer.
- B. A detailed keying schedule is to be approved by the SLUSD and/or architect in consultation with a representative of Allegion or an Authorized Key Center or Authorized Security Center. Each keyed cylinder on every keyed lock is to be listed separately showing the door #, key group (in BHMA terminology), cylinder type, finish and location on the door.
- C. Furnish all cylinders in the Schlage Full Size Interchangeable Core (FSIC). Pack change keys independently (PKI). Keys to be provided in individual envelopes labeled with respective door identification numbers. Stamp each change key with change number and stamp set symbol. Stamp each master key with set symbol as applicable.
- D. Contractor shall provide construction keying for doors requiring locking during construction.
- E. Furnish all keys with visual key control. Stamp key "Do Not Duplicate".
- F. Furnish mechanical keys as follows:
1. Furnish 2 cut change keys for each different change key code.
 2. Furnish 1 uncut key blank for each change key code.
 3. Furnish 6 cut masterkeys for each different masterkey set.
 4. Furnish 3 uncut key blanks for each masterkey set.

- C. Furnish all cylinders in the Schlage Full Size Interchangeable Core (FSIC). Pack change keys independently (PKI). Keys to be provided in individual envelopes labeled with respective door identification numbers. Stamp each change key with change number and stamp set symbol. Stamp each master key with set symbol as applicable.
- D. Contractor shall provide construction keying for doors requiring locking during construction.
- E. Furnish all keys with visual key control. Stamp key "Do Not Duplicate".
- F. Furnish mechanical keys as follows:
 - 1. Furnish 2 cut change keys for each different change key code.
 - 2. Furnish 1 uncut key blank for each change key code.
 - 3. Furnish 6 cut masterkeys for each different masterkey set.
 - 4. Furnish 3 uncut key blanks for each masterkey set.
 - 5. Furnish 2 cut control keys cut to the top masterkey for permanent I/C cylinders.
 - 6. Furnish 1 cut control key cut to each SKD combination.

2.4 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; aluminum stainless steel unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc.
 - b. Trimco.

2.5 ACCESSORIES FOR PAIRS OF DOORS

- A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release; and with internal override.
- B. Carry-Open Bars: BHMA A156.3; prevent the inactive leaf from opening before the active leaf; provide polished brass or bronze carry-open bars with strike plate for inactive leaves of pairs of doors unless automatic or self-latching bolts are used.
- C. Astragals: BHMA A156.22.

2.6 SLIDING DOOR HARDWARE

- A. Sliding Door Hardware: BHMA A156.14; consisting of complete sets including rails, hangers, supports, bumpers, floor guides, and accessories indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Hager Companies.
 - b. AD Systems

2.7 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Architect.
 - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
 - 3. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.8 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.

- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with door and hardware manufacturers' written instructions.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
 - 3. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule, but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches.
- E. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as indicated in keying schedule.
 - 2. Furnish permanent cores to Owner for installation.

- F. Key Control System:
 - 1. Key Control Cabinet: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
 - 2. Key Lock Boxes: Install where indicated or approved by Architect to provide controlled access for fire and medical emergency personnel.
 - 3. Key Control System Software: Set up multiple-index system based on final keying schedule.
- G. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.
 - 1. Configuration: Provide one power supply for each door opening with electrified door hardware.
- H. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 07 9200 "Joint Sealants."
- I. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- J. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - 1. Do not notch perimeter gasketing to install other surface-applied hardware.
- K. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- L. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
 - 1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
 - 2. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 70 degrees and so that closing time complies with accessibility requirements of authorities having jurisdiction.

3. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
- B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.8 DEMONSTRATION

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

3.9 DOOR HARDWARE SCHEDULE

- A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.
- B. While the hardware schedule is intended to cover all doors, and other movable parts of the building, and establish type and standard of quality, the contractor is responsible for examining the Plans and Specifications and furnishing proper hardware for all openings whether listed or not. If there are any omissions in hardware groups in regard to regular doors they shall be called to the attention of the Architect prior to bid opening for instruction; otherwise, list will be considered Complete. No extras will be allowed for omissions.
- C. The Door Schedule on the Drawings indicates which hardware set is used with each door.

MANUFACTURERS ABBREVIATIONS

ADS	=	AD Systems	Sliding Door Hardware
GLY	=	Glynn-Johnson	Overhead Door Stops

IVE = Ives	Hinges, Flush Bolts, Dust Proof Strikes, Door Stops,
LCN = LCN	Kick/Mop Plates & Silencers
SCE = Schlage Electronics	Door Closers
SCH = Schlage Lock	Wireless Electronic Locks
VON = Von Duprin	Locks, Latches & Cylinders
ZER = Zero International	Exit Devices
	Thresholds, Gasketing & Weather-stripping

HW GROUP NO. 01 (RESTROOM)

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	VANDL STOREROOM LOCK	ND96PD RHO	626	SCH
1	EA	FSIC CORE	80-037	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA/TB	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	US26D	IVE
1	EA	FLOOR STOP	FS436	US26D	IVE

HW GROUP NO. 02 (CLEAN ROOM & TOOL ROOM)

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	4BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	VANDL CLASSROOM LOCK	ND95PD RHO XN 12-035	626	SCH
1	EA	FSIC CORE	80-037	626	SCH
1	EA	FLOOR STOP	FS436	US26D	IVE

HW GROUP NO. 03 (CNC ROOM – SLIDING DOOR)

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	LADDER PULL	AD5464-P-LP	US32D	ADS
1	EA	ADA COMPLIANT LOCKING HARDWARE	AD5464-P-LP	US32D	ADS

HW GROUP NO. 04 (DOUBLE DOOR WITH PANIC HARDWARE)

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	CYLINDER DOGGING W/ THUMBTURN KIT	CDTT3000UK	630	FCBP

END OF SECTION 08 7100

SECTION 09 2900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Exterior gypsum board for ceilings and soffits.
 - 3. Tile backing panels.
- B. Related Requirements:
 - 1. Section 06 1600 "Sheathing" for gypsum sheathing for exterior walls.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Gypsum wallboard.
 - 2. Gypsum board, Type X.
 - 3. Impact-resistant gypsum board.
 - 4. Acoustically enhanced gypsum board.
 - 5. Acoustical sealant.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.
 - 2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, 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 testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Wallboard: ASTM C1396/C1396M.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. [American Gypsum.](#)
 - b. [Certaineed; SAINT-GOBAIN.](#)
 - c. [PABCO Gypsum.](#)
 - d. [USG Corporation.](#)
2. Thickness: 1/2 inch.
 3. Long Edges: Tapered.
- B. Gypsum Board, Type X: ASTM C1396/C1396M.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [American Gypsum.](#)
 - b. [Certaineed; SAINT-GOBAIN.](#)
 - c. [PABCO Gypsum.](#)
 - d. [USG Corporation.](#)
 2. Thickness: 5/8 inch.
 3. Long Edges: Tapered.
- C. Impact-Resistant Gypsum Board: ASTM C1396/C1396M gypsum board, tested according to ASTM C1629/C1629M.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [American Gypsum.](#)
 - b. [Certaineed; SAINT-GOBAIN.](#)
 - c. [PABCO Gypsum.](#)
 - d. [USG Corporation.](#)
 2. Core: 5/8 inch, Type X.
 3. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 3 requirements.
 4. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
 5. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 3 requirements.
 6. Hard-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 2 requirements according to test in Annex A1.
 7. Long Edges: Tapered.
 8. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.4 SPECIALTY GYPSUM BOARD

- A. Acoustically Enhanced Gypsum Board: ASTM C1396/C1396M. Multilayer products constructed of two layers of gypsum boards sandwiching a viscoelastic sound-absorbing polymer core.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Certaineed; SAINT-GOBAIN.](#)
 - b. [PABCO Gypsum.](#)
 2. Core: 5/8 inch, regular type.
 3. Long Edges: Tapered.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - 2. Exterior Gypsum Soffit Board: Paper.
 - 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 - 4. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

2.6 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
 - 1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Hilti, Inc.
 - b. Pecora Corporation.

- c. USG Corporation.
- F. Thermal Insulation: As specified in Section 07 2100 "Thermal Insulation."
- G. Vapor Retarder: As specified in Section 07 2600 "Vapor Retarders."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

- A. Comply with ASTM C840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Wallboard Type: Outer-side of room where equipment are stored.
 - 2. Type X: Where required for fire-resistance-rated assembly.
 - 3. Impact-Resistant Type: Inner-side of room where equipment are stored.
 - 4. Acoustically Enhanced Type: Ceiling.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
 - 1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 - 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer

- joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- E. Curved Surfaces:
1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them.
 2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.4 INSTALLATION OF TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners.
 2. Bullnose Bead: Use where indicated.
 3. LC-Bead: Use at exposed panel edges.
 4. L-Bead: Use where indicated.
 5. U-Bead: Use at exposed panel edges.
 6. Curved-Edge Cornerbead: Use at curved openings.
- D. Exterior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners.
 2. LC-Bead: Use at exposed panel edges.

3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.

- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile.
 - 3. Level 3: Panels that are substrate for architectural paneling.
 - 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 09 9123 "Interior Painting."

3.6 INSTALLATION OF TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written instructions.

3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 2900

SECTION 09 6513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Thermoset Rubber Base

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.
- C. Samples for Initial Selection: For each type of product indicated.
- D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.
- E. Product Schedule: For resilient base and accessory products.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F, in spaces to receive resilient products during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 85 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Johnsonite; a Tarkett company.
 - 2. Roppe Corporation.
- B. Product Standard: ASTM F1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
 - 1. Style and Location:
 - a. Style A, Cove: Provide in areas with sealed concrete floor
- C. Thickness: 0.125 inch.
- D. Height: 4 inches.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Preformed.
- G. Inside Corners: Job formed or preformed.
- H. Colors: As indicated by manufacturer's designations

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
 - 4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

- D. Do not install resilient products until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - 2. Tightly adhere to substrates throughout length of each piece.
 - 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from resilient stair treads before applying liquid floor polish.
 - 1. Apply two coat(s).
- E. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 09 6513

SECTION 09 9123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Primers.
 - 2. Water-based finish coatings.
 - 3. Solvent-based finish coatings.
 - 4. Floor sealers and paints.
 - 5. Dry fall coatings.
- B. Related Requirements:
 - 1. Section 05 5000 "Metal Fabrications" for shop priming metal fabrications.
 - 2. Section 09 9300 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include preparation requirements and application instructions.
 2. Indicate VOC content.
- B. Samples: For each type of topcoat product.
- C. Samples for Initial Selection: For each type of topcoat product.
- D. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
1. Submit Samples on rigid backing, 8 inches square.
 2. Apply coats on Samples in steps to show each coat required for system.
 3. Label each coat of each Sample.
 4. Label each Sample for location and application area.
- E. Product Schedule: Use same designations indicated on Drawings and in the Interior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Paint Products: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
 - b. Other Items: Architect will designate items or areas required.
 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 1. [Kelly-Moore Paint Company Inc.](#)
 2. Benjamin Moore.
 3. Sherwin Williams.
- B. Source Limitations: Obtain each paint product from single source from single manufacturer.

2.2 PAINT PRODUCTS, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: As selected by Architect from manufacturer's full range.
 1. Twenty percent of surface area will be painted with deep tones.

2.3 FLOOR SEALERS AND PAINTS

- A. Water-Based Concrete Floor Sealer: Clear, water-based, acrylic-copolymer-emulsion sealer formulated for oil, gasoline, alkali, and water resistance and for use on concrete traffic surfaces.
 1. [PPG](#) Paints; PPG Industries, Inc.
 2. Rust-Oleum Corporations
 3. Sherwin-Williams Company

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Fiber-Cement Board: 12 percent.
 - 3. Masonry (Clay and CMUs): 12 percent.
 - 4. Wood: 15 percent.
 - 5. Gypsum Board: 12 percent.
 - 6. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.
- F. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- G. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 - 1. SSPC-SP 2.
 - 2. SSPC-SP 3.
 - 3. SSPC-SP 7/NACE No. 4.
 - 4. SSPC-SP 11.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 INSTALLATION

- A. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in equipment rooms:
 - a. Equipment, including panelboards and switch gear.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.
 - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - 2. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Other items as directed by Architect.
 - 3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry-Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry-film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry-film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry-film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
 - 1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.

2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
 3. Allow empty paint cans to dry before disposal.
 4. Collect waste paint by type and deliver to recycling or collection facility.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Interior, institutional low-odor/VOC primer sealer.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC. Matching topcoat.
 - c. Topcoat: Interior latex, institutional low odor/VOC, low sheen.
- B. Galvanized-Metal Substrates:
1. Latex System:
 - a. Prime Coat: Cementitious galvanized primer.
 - b. Intermediate Coat: Latex, interior. Matching topcoat.
 - c. Topcoat: Interior, latex, semigloss (MPI Gloss Level 5).
- C. Steel Substrates:
1. Latex System, Alkyd Primer:
 - a. Prime Coat: Primer, alkyd, quick dry, for metal
 - b. Intermediate Coat: Latex, interior. Matching topcoat.
 - c. Topcoat: Interior, latex, interior, semigloss (MPI Gloss Level 5).
- D. Gypsum Board and Plaster Substrates:
1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Interior, institutional low-odor/VOC primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low odor/VOC, (MPI Gloss Level 3).
- E. Acoustic Panels and Tiles:
1. Institutional Low-Odor/VOC Latex System:
 - a. Prime Coat: Matching topcoat.

- b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, institutional low odor/VOC, flat.
- F. Mechanical and Electrical Work: Paint all exposed items throughout the project except factory finished items with factory-applied baked enamel finishes which occur in mechanical rooms or areas, and excepting chrome or nickel plating, stainless steel, and aluminum other than mill finished. Paint all exposed ductwork and inner portion of all ductwork. Same as specified for other interior metals, hereinabove.

END OF SECTION 09 9123

SECTION 10 1143 - VISUAL DISPLAY WALL PANELS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Section Includes:
 - 1. Porcelain enamel Marker Walls
- B. Related Sections Include:
 - 1. 10 11 16 Porcelain enamel Markerboards
 - 2. 12 35 00 Specialty Casework

1.02 REFERENCED STANDARDS

- A. American Society for Testing Materials
 - 1. ASTM-E 84 Standard Test Method for Surface Burning Characteristics for Building Materials
 - 2. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.

1.03 SUBMITTALS

- A. Shop Drawings: Provide shop drawings for each type of visual display board required.
- B. Product Data: Provide technical data for materials specified. Include Material Safety Data Sheets, when applicable.
- C. Samples and color charts: Provide Manufacturer's color charts and composition samples of face, core, backing and trim to illustrate finish, color and texture, where required.
- D. Manufacturer's Instructions: Provide Manufacturer's installation instructions.

1.04 QUALITY ASSURANCE

- A. Provide all items in this section as manufactured by: Claridge Products and Equipment, Inc., Harrison, Arkansas 72602-0910, Phone: (870)743-2200 Fax: (870)743-1908
- B. Regulatory Requirements: Conform to applicable code for flame/smoke rating in tackboards in accordance with ASTM-E 84.
- C. Operation and Maintenance: Include data on regular cleaning, stain removal, and precautions.

1.05 PROJECT CONDITIONS

- A. Field measure prior to preparation of shop drawings and fabrication to ensure proper fit.
- B. Comply with manufacturer's recommendations for climatizing area for interior moisture and temperature to approximate normal occupied conditions.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delay.
- B. Delivery: Deliver materials in original, unopened, undamaged containers with identification labels intact.
- C. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1.07 WARRANTY

- A. Submit a "Life of the Building" warranty, stating that under normal usage and maintenance, and when installed in accordance with manufacturer's instructions and recommendations, Claridge LCS³ porcelain enamel steel markerboard writing surfaces are guaranteed for the life of the building. Guarantee covers replacement of defective boards but does not include cost of removal or reinstallation.
- B. Submit a standard warranty, stating when installed in accordance with manufacturer's instructions and recommendations, Claridge tackboards are guaranteed for one year against defects in materials and workmanship. Guarantee does not cover normal wear and tear, improper handling, any misuse, or any defects caused by vandalism or subsequent abuse. Guarantee covers replacement of defective material but does not include cost of removal or reinstallation.
- C. Writing Surface Warranty Period: 10 years commencing on Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Visual Display Surface Manufacturer: Claridge Products and Equipment, Inc.
 - 1. Contact: P. O. Box 910, Harrison, AR 72602; Telephone: (870) 743-2200; Fax: (870) 743-1908; E-Mail: claridge@claridgeproducts.com; web site: www.claridgeproducts.com.

2.02 MATERIALS

- A. Claridge Porcelain Enamel Markerboard Surface: Porcelain enamel LCS³ markerboard surface shall be manufactured in accordance with Porcelain Enamel Institute's specification. Cold-rolled steel surface is pre-cleaned and treated to ensure complete bond between the steel and the porcelain. During a 3-coat process, both steel surfaces receive a ground coat of porcelain enamel. A color cover coat of porcelain enamel is applied to one surface of the ground coat and is fusion bonded to the steel substrate at temperature necessary to reduce steel and porcelain stresses and achieve superior enamel bond and hardness.
 - 1. Claridge Porcelain Enamel Marker Walls
 - a. Architect to specify Porcelain Enamel laminated panels with matched butt joints and steel splines.
Face Sheet: LCS³ Porcelain Enamel Steel Skin
Core: 7/16" MDF core
Backer: Standard Moisture Barrier Backing
 - b. Laminations (where required): Shall be hot-type neoprene contact adhesive applied to both surfaces automatically. Each substrate shall have a minimum of 80% covering with 1.5-2.0 dry mils of adhesive. Panel components shall have uniform pressure applied mechanically over entire area. Laminations shall be made by face sheet manufacturer.
 - c. Size: As indicated in drawings.
 - d. Color: LCS³ No. 100 White.
- B. Claridge Extruded Aluminum Trim with Satin Anodize Finish and Accessories
 - 1. Marker Wall Trim
 - a. 1016 Trim with 1015 Ground

2.03 FABRICATION

- A. Shop assembly: Field assembly

PART 3 - EXECUTION

3.01 PROJECT CONDITIONS

- A. Verify before installation that interior moisture and temperature approximate normal occupied conditions.
- B. Verify that wall surfaces are prepared and ready to receive boards.

3.02 INSTALLATION

- A. Deliver factory built units completely assembled and of dimensions shown in details and in accordance with manufacturer's shop drawings as approved by the architect.
- B. Follow manufacturer's instructions for storage and handling of units before installation.
- C. Do not install boards on damp walls or in damp and humid weather without heat in the building.
- D. Install level and plumb, keeping perimeter trim straight in accordance with manufacturer's recommendations.

3.03 ADJUST AND CLEAN

- A. Verify that all accessories are installed as required for each unit.
- B. At completion of work, clean surfaces and trim in accordance with manufacturer's recommendations, leaving all materials ready for use.

END OF SECTION 10 1143

SECTION 10 1423.16 - ROOM-IDENTIFICATION PANEL SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes room-identification signs that are directly attached to the building.

1.3 ALLOWANCES

- A. Allowances for room-identification signs are specified in Section 01 2100 "Allowances."

1.4 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 01 2200 "Unit Prices."

1.5 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.6 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.
- B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.7 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For room-identification signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Room-Identification Signs: Full-size Sample.
 - 2. Variable Component Materials: Full-size Sample of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
 - 3. Exposed Accessories: Full-size Sample of each accessory type.
 - 4. Full-size Samples, if approved, will be returned to Contractor for use in Project.
- E. Product Schedule: For room-identification signs. Use same designations indicated on Drawings or specified.

1.8 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Sample Warranty: For special warranty.

1.9 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.10 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tools: One set(s) of specialty tools for assembling signs and replacing variable sign components.

1.11 QUALITY ASSURANCE

- A. Installer Qualifications: [Manufacturer of products] [An entity that employs installers and supervisors who are trained and approved by manufacturer].

1.12 FIELD CONDITIONS

- A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.13 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" the ABA standards of the Federal agency having jurisdiction and CBC Chapter 11B.

2.2 ROOM-IDENTIFICATION SIGNS

- A. Room-Identification Sign <Insert drawing designation>: **[Sign] [Sign system]** with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. [ACE Sign Systems, Inc.](#)
 - b. [Advance Corporation.](#)
 - c. [Mohawk Sign Systems.](#)
 2. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.
 - a. Composite-Sheet Thickness: 0.125 inch.
 - b. Color(s): As selected by Architect from manufacturer's full range.
 3. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition: Square cut.
 - b. Corner Condition in Elevation: Square.
 4. Mounting: Surface mounted to wall with countersunk flathead through fasteners and adhesive.
 5. Text and Typeface: Characters on signs shall be raised 1/32 inch and shall be sans serif uppercase case characters accompanied by Grade 2 Braille.
 6. Character Size: Raised characters shall be a minimum of 5/8 inch and a maximum of 2".

7. Finish and contrast: Contrast between character, symbols and their background must be 70% minimum and have a non-glare finish to comply with 11B-703.5.1
8. Braille: Contracted Grade 2 Braille shall be used wherever Braille is required on other portions of these standards, dots shall be 1/10th inch on centers with 2/10-inch space between cells, measured from the second column of dots in the first cell to the first column of dots in the second cell. Dots shall be raised a minimum 1/40 inch above the background.

2.3 SIGN MATERIALS

- A. Aluminum Sheet and Plate: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Aluminum Extrusions: ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- D. Vinyl Film: UV-resistant vinyl film with pressure-sensitive, permanent adhesive; die cut to form characters or images as indicated on Drawings.
- E. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
 1. Use concealed fasteners and anchors unless indicated to be exposed.
 2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened sign unless otherwise indicated.
 - b. Fastener Heads: Use flathead or oval countersunk screws and bolts with tamper-resistant Allen-head or one-way-head slots unless otherwise indicated.
 4. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly unless otherwise indicated.
 - b. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, and installed in predrilled holes.
- B. Adhesive: As recommended by sign manufacturer.
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

- D. Hook-and-Loop Tape: Manufacturer's standard two-part tape consisting of hooked part on sign back and looped side on mounting surface.
- E. Magnetic Tape: Manufacturer's standard magnetic tape with adhesive on one side.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 4. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
- B. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.
- C. Subsurface-Etched Graphics: Reverse etch back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

- B. Accessibility: Install signs in locations on walls as indicated on Drawings and according to the accessibility standard.
- C. Mounting Methods:
 - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
 - 2. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
 - 3. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

3.2 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 1423.16

SECTION 10 2113.17 - PHENOLIC-CORE TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Phenolic-core toilet compartments configured as toilet enclosures.
- B. Related Requirements:
 - 1. Section 05 5000 "Metal Fabrications" for supports that attach floor-and-ceiling-anchored compartments to overhead structural system.
 - 2. Section 06 1053 "Miscellaneous Rough Carpentry" for blocking overhead support of floor-and-ceiling-anchored compartments.
 - 3. Section 10 2800 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories mounted on toilet compartments.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.
- B. Shop Drawings: For toilet compartments.
 - 1. Include plans, elevations, sections, details, and attachment details.
 - 2. Show locations of cutouts for compartment-mounted toilet accessories.
 - 3. Show locations of centerlines of toilet fixtures.
 - 4. Show locations of floor drains.
 - 5. Show overhead support or bracing locations.
- C. Samples for Initial Selection: For each type of toilet compartment material indicated.
 - 1. Include Samples of hardware and accessories involving material and color selection.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
 - 1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch-square Samples of same thickness and material indicated for Work.
 - 2. Each type of hardware and accessory.

- E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of toilet compartment.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Door Hinges: Five hinge(s) with associated fasteners.
 2. Latch and Keeper: Two latch(es) and keeper(s) with associated fasteners.
 3. Door Bumper: Two door bumper(s) with associated fasteners.
 4. Door Pull: Two door pull(s) with associated fasteners.
 5. Fasteners: Ten fasteners of each size and type.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and CBC Chapter 11B for toilet compartments designated as accessible.

2.2 PHENOLIC-CORE TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. [ASI Global Partitions.](#)
 2. [Bobrick Washroom Equipment, Inc.](#)

- B. Toilet-Enclosure Style: Floor and ceiling anchored.
- C. Door, Panel, and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges. Provide minimum 3/4-inch-thick doors and pilasters and minimum 1/2-inch-thick panels.
- D. Pilaster Shoes and Sleeves (Caps): Formed from stainless steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.
- E. Brackets (Fittings):
 - 1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.
- F. Phenolic-Panel Finish:
 - 1. Facing Sheet Finish: One color and pattern in each room.
 - 2. Color and Pattern: As selected by Architect from manufacturer's full range **<Insert color and pattern>**, with manufacturer's standard dark color core.
 - 3. Edge Color: Manufacturer's standard matching facing sheet color.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.
 - 1. Hinges: Manufacturer's minimum 0.062-inch-thick stainless steel paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door. Mount with through-bolts.
 - 2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
 - 3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
 - 4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless steel bumper at out-swinging doors. Mount with through-bolts.
 - 5. Door Pull: Manufacturer's heavy-duty cast-stainless steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

- A. Aluminum Castings: ASTM B26/B26M.

- B. Aluminum Extrusions: ASTM B221.
- C. Brass Castings: ASTM B584.
- D. Brass Extrusions: ASTM B455.
- E. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
- F. Stainless Steel Castings: ASTM A743/A743M.
- G. Zamac: ASTM B86, commercial zinc-alloy die castings.

2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- D. Ceiling-Hung Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for connection to structural support above finished ceiling. Provide assemblies that support pilasters from structure without transmitting load to finished ceiling. Provide sleeves (caps) at tops of pilasters to conceal anchorage.
- E. Floor-and-Ceiling-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
- F. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide in-swinging doors for standard toilet compartments and 36-inch-wide out-swinging doors with a minimum 32-inch-wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch.
 - b. Panels and Walls: 1 inch.
 - 2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.
- D. Ceiling-Hung Units: Secure pilasters to supporting structure and level, plumb, and tighten. Hang doors and adjust so bottoms of doors are level with bottoms of pilasters when doors are in closed position.
- E. Floor-and-Ceiling-Anchored Units: Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.
- F. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 10 2113.17

SECTION 10 2800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Childcare accessories.
 - 3. Underlavatory guards.
 - 4. Custodial accessories.

1.2 ALLOWANCES

- A. See Section 01 2100 "Allowances" for description of allowances affecting items specified in this Section.

1.3 UNIT PRICES

- A. See Section 01 2200 "Unit Prices" for description of unit prices affecting items specified in this Section.

1.4 ALTERNATES

- A. See Section 01 2300 "Alternates" for description of alternates affecting items specified in this Section.

1.5 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Include electrical characteristics.

- B. Samples: For each exposed product and for each finish specified, full size.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify accessories using designations indicated.

1.7 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranties.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

1.9 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, visible silver spoilage defects.
 - 2. Warranty Period: 15 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Toilet-Compartment Occupancy-Indicator Systems: Manufacturer agrees to repair or replace toilet-compartment occupancy-indicator systems that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

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. Structural Performance: Design accessories and fasteners to comply with the following requirements:
 - 1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

B. Toilet Tissue (Roll) Dispenser:

1. **Manufacturers:** Subject to compliance with requirements, provide products by the following:
 - a. [Bobrick Washroom Equipment, Inc.](#)
2. Description: Double-roll dispenser.
3. Mounting: Partition mounted, serving two adjacent toilet compartments Surface mounted.
4. Operation: **[Noncontrol delivery with standard spindle] [Noncontrol delivery with theft-resistant spindle] [Spindleless with tension-spring controlled delivery] [Spindleless with tension-spring controlled delivery and self-locking device extending through core that prevents core removal until roll is empty] [Eccentric-shaped, molded-plastic spindle revolves one-half revolution per dispensing operation for controlled delivery; core cannot be removed until roll is empty].**
5. Capacity: Designed for 5-inch- diameter tissue rolls.
6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

C. Grab Bar:

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Bobrick Washroom Equipment, Inc.](#)
 - b. [Bradley Corporation.](#)
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.
 - a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin) on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/4 inches.
5. Configuration and Length: As indicated on Drawings.

D. Seat-Cover Dispenser <Insert drawing designation>:

1. **Manufacturers:** Subject to compliance with requirements, provide products by the following:
 - a. [Bobrick Washroom Equipment, Inc.](#)
2. Mounting: Surface mounted.
3. Minimum Capacity: 250 seat covers.
4. Exposed Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
5. Lockset: Tumbler type.

E. Hook <Insert drawing designation>:

1. **Manufacturers:** Subject to compliance with requirements, provide products by the following:
 - a. [Bobrick Washroom Equipment, Inc.](#)

2. Description: Double-prong unit.
3. Material and Finish: Polished chrome-plated brass.

2.3 MATERIALS

- A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.031-inch-minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B19, flat products; ASTM B16/B16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B30, castings.
- C. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), 0.036-inch-minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.
- G. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.4 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
 1. Remove temporary labels and protective coatings.
- B. Grab Bars: Install to comply with specified structural-performance requirements.
- C. Shower Seats: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 2800

SECTION 12 50 10 0 – WORKSHOP FURNITURE

1 GENERAL

1.1 INTENT

- 1.1.1 Office furniture performance criteria listed in the Contract Documents establish the minimum design standards and performance criteria for furniture indicated for use in this Project.
- 1.1.2 These documents are intended to provide the Qualified Respondent with latitude to develop a comprehensive furniture solution utilizing these criteria; it is not intended to be a technical product specification.
- 1.1.3 The philosophy for providing these documents to the Qualified Respondent is to provide sufficient information on which they can base a competitive Proposal, using a weighted scoring system, for furniture meeting the functional, aesthetic and Performance requirements established by the Contract Documents, using furniture and accessories from their representative product manufacturers.
- 1.1.4 The criteria for assessing the requirements for this Project are provided by the following documents forming a part of the Contract Documents package:
 - 1.1.4.1 Furniture Schedule defines aesthetic standards, ergonomic requirements and service levels.
 - 1.1.4.2 Consultant will use the referenced specification sections, Furniture Schedule to assess that aesthetic appearance and finish is coordinated with the appropriate Space or Room description.
- 1.1.5 Information contained in the technical specifications that identifies office furniture performance criteria is general information only; where a conflict between furniture specifications and other referenced documents, refer to [Section 00 1119](#) for clarification requirements.

1.2 RELATED REQUIREMENTS

- 1.2.1 Section 12 5100 – Office Furniture

1.3 REFERENCE STANDARDS

- 1.3.1 All products supplied by the Qualified Respondent shall meet compliance of applicable [CSA](#), [ANSI/BIFMA](#) and other listed testing standards as appropriate to the furniture type specified in each referenced specification section.
- 1.3.2 Drawing Reference:
 - 1.3.2.1 Refer to Furniture Schedule, that form a part of this document for project quantities.
 - 1.3.2.2 Every attempt has been made to reflect requirements for individual furniture manufacturers including, but not limited to, the following:
 - 1.3.2.2.1 Dimensions, sizes of furniture may vary slightly from individual alternate manufacturers standard.
 - 1.3.2.2.2 It is expected that alternate and substitution manufacturers take into account variances and nominally adjust the information for specific furniture components.
 - 1.3.2.2.3 Overall dimensions match the building grid and cannot be adjusted larger than the parameters indicated.
 - 1.3.2.3 Location of equipment, fixtures and outlets indicated or specified shall be considered as approximate; locate furniture to comply with locations illustrated.
 - 1.3.2.4 Consultant may furnish additional drawings for clarification; these additional Drawings have same meaning and intent as if they were included with plans referred to in Contract Documents.

1.4 DEFINITIONS

- 1.4.1 Flexibility/Change Management: Future planning scenarios shall be considered when specifying furniture solutions. It is intended that the final furniture solutions support future flexibility by utilizing components that provide maximum planning configurations with consistent modularity. Ease of reconfigurations with minimal employee downtime, are also important factors of the furniture solution.
- 1.4.2 Technology Accommodation: All proposed furniture shall demonstrate the ability to adapt to new technologies as the public and private areas of the Facility evolve. The ability to manage current data and electrical cables in an efficient manner is critical. It is intended that data and electrical cables can be easily moved and changed as areas of the Facility are reconfigured. Furniture shall support current concepts data delivery (i.e. zone distribution, localized wireless networks). Future hardware requirements such as flat screen technology shall also be addressed in furniture solutions.
- 1.4.3 Standardization/Modularity: It is the intent that all proposed furniture provides maximum planning configurations with minimal components. Inherent in this principle is the need to minimize the number of standard sizes and number of furniture components.
- 1.4.4 Ergonomics: Providing a safe and healthy environment for all people utilizing the Facility is of primary importance. Sound ergonomic principles such as ease of adjustment, intuitive controls, soft/eased edges, convenient access to primary work tools shall be apparent in proposed furniture solutions. It is expected that all proposed furniture would meet the ergonomics requirements stated in this document as a Minimum Requirement.

1.5 SUBMITTALS

- 1.5.1 Respondent(s) shall provide submittals requested in the referenced specification sections, and the following:
 - 1.5.1.1 Submit method of packaging and protection of furniture during transportation and delivery with Proposal Submission.
 - 1.5.1.2 Submit product brochures indicating proposed materials, appearance and technical specifications of construction.
 - 1.5.1.3 Provide large samples of finishes for substitute products only, prior to ordering materials for Consultant's confirmation and on-site verification.
- 1.5.2 Submit **five (5)** copies of shop drawings and product data required by the Contract Documents and for such other items as the Owner may reasonably request; do not proceed with work until related submission has been reviewed.

1.6 PROJECT CLOSEOUT SUBMISSIONS

- 1.6.1 Provide operations and maintenance information in accordance with [Section 01 7823 – Operations and Maintenance Data](#) including, but not limited to, the following:
 - 1.6.1.1 Methods for maintaining painted or coated finishes.
 - 1.6.1.2 Precautions for cleaning materials and methods that could be detrimental to finishes and performance.

1.7 QUALITY ASSURANCE

- 1.7.1 Quality Expectations:
 - 1.7.1.1 Furniture products provided must meet a level of quality that will withstand daily use in a public facility with high traffic.
 - 1.7.1.2 Warranty requirements set out in this document shall be the Minimum Requirement for quality expectations.
 - 1.7.1.3 It is imperative that lifecycle requirements are factored into furniture submissions; provide furniture that requires minimal downtime for maintenance over the lifecycle of the furniture provided.

- 1.7.1.4 Qualified Respondent shall clearly identify the manufacturer's commitment to quality, and programs in place to ensure initial and ongoing quality is maintained, i.e. 150 certification.
- 1.7.1.5 Qualified Respondent shall confirm that the manufacturer has met all the requirements of the technical specifications; if custom, non-standard components are necessary to meet the specification, these costs shall be included in the Proposal.
- 1.7.1.6 Qualified Respondent will be required to participate in a cost adjustment plan, regarding the deployment of a performance monitoring system which will permit Payments to be adjusted for poor performance or unavailability.
- 1.7.2 Codes and Regulations:
 - 1.7.2.1 Adhere to applicable provincial laws, municipal bylaws and the acts, statutes, bylaws, codes, orders, rules and regulations of all governmental authorities having jurisdiction over the work throughout the performance of the Agreement.
- 1.7.3 Non-Obsolescence:
 - 1.7.3.1 Proposed products shall be current and availability shall be guaranteed for a minimum of **ten (10) years**.
 - 1.7.3.2 Successful Respondent(s) shall provide written notice of any physical change to the product line at time of order, any physical changes to the product line shall accommodate inter-changeability and compatibility with the existing product.

1.8 DELIVERY STORAGE AND HANDLING

- 1.8.1 Coordinate with Owner for delivery times and access to the site:
 - 1.8.1.1 Provide a minimum of **fifteen (15) days** notice indicating that furniture will be ready for shipment, and the manner in which the shipment will be made.
 - 1.8.1.2 Provide a minimum of **24 hours** notice by telephone of anticipated time of actual delivery.
- 1.8.2 Delivery Location: Deliver furniture in manufacturer's original intact packaging to the following location:
 - 1.8.2.1 Project Site
Art Building, 900 Fallon Street, Oakland, CA 94607
- 1.8.3 Sequence the delivery of materials to take into account other contractors that may still be working on site.
- 1.8.4 Storage on site for materials will be limited to the immediate area of the Work assigned to the Respondent:
 - 1.8.4.1 There will be no additional site storage available to the Respondent.
 - 1.8.4.2 Respondent shall arrange and pay for any off site storage costs arising from bulk delivery of materials.
 - 1.8.4.3 Schedule "Just-In-Time" delivery of materials to site and store materials in area of work.
 - 1.8.4.3.1 No other storage facilities are available on site.
 - 1.8.4.3.2 Be responsible for obtaining any required off-site storage required for materials of this project.
 - 1.8.4.3.3 Schedule deliveries to avoid double movements of materials on site.
 - 1.8.4.3.4 Cooperate with other contractors and schedule delivery of materials to allow for other contractors activities.
- 1.8.5 Hours of Work:

- 1.8.5.1 Coordinate hours of work with the Owner.
- 1.8.5.2 Regular hours of work are Monday to Friday; 8:00 AM to 4:30 PM, with the exception of statutory holidays, which will be non-working days.
- 1.8.6 Permanently and legibly mark furniture pieces with the name or recognized trademark of the manufacturer complete with clear and complete instructions outlining any adjustable features of the component, if applicable.
- 1.8.7 Tag boxes or items for easy identification and assembly on site.

1.9 WARRANTY

- 1.9.1 Provide manufacturer' standard product warranty indicating that they will be responsible to repair or replace affected part or parts to the satisfaction of the Owner at no additional cost for labour or materials, that fail in materials or workmanship within specified warranty period; materials failures will include, but are not be limited to, manufacturing defects and failure of fabric coverings that wear out within an unreasonable time period; warranty shall be exclusive of normal wear, and as follows:
 - 1.9.1.1 Material Warranty Period: **Ten (10) years** from date of Substantial Performance, prorated, with first **three (3) years** non-prorated.
 - 1.9.1.2 Workmanship Warranty Period: **Ten (10) years** from date of Substantial Performance.
 - 1.9.1.3 If extended warranty periods are offered on any specified products through the manufacturer, the Qualified Respondent shall make these available.

2 PRODUCTS

2.1 MANUFACTURERS

- 2.1.1 Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; manufacturers listed as additional Acceptable Products and that offer similar products may be incorporated into the work of this Section provided they meet the performance requirements established by the named products.

2.1.2 WORKTABLES

<u>Item</u>	<u>Manufacturer</u>	<u>Acceptable Substitutes</u>
Worktable	Benchpro (Kennedy Series)	Uline, Grainger

Surface Material: Oiled Butcher Block (Solid Maple Hardwood Grade A)

Surface Thickness: 1 3/4"

Table Leg Type: Straight with no Shelving or horizontal bar on the long side

Frame Material / Color: Steel / Black

Load Capacity: Minimum 6000 lbs

Desk Height: 30"

Accessories: Adjustable legs.

3 EXECUTION

3.1 PREPARATION

- 3.1.1 Assume full responsibility for and execute complete layout of work to locations.
- 3.1.2 Provide devices needed to lay out work:

- 3.1.2.1 Storage of materials prior to delivery to site ready for setting out of work will be the responsibility of the Respondent.
- 3.1.2.2 Limited space is available on site in the immediate area of work for laying out and setting up materials required by this Contract.
- 3.1.2.3 Provide all necessary pieces of equipment, materials and furniture required for complete installation.

3.2 INSTALLATION

- 3.2.1 Install in accordance with manufacturer's written instructions using trained and competent personnel.
- 3.2.2 Train Owner's personnel in the maintenance of furniture.
- 3.2.3 Deliver scheduled furniture to site and set up in groups and in locations as illustrated on Consultants furniture plan drawings and ready for takeover review on or before dates indicated in Item **Error! Reference source not found.**
- 3.2.4 Secure item to floor once Consultant has confirmed final location where indicated that the product must be able to be fixed to floor; include cost for securing item to floor in Proposal Price.

3.3 CLOSEOUT ACTIVITIES

- 3.3.1 Adjusting:
 - 3.3.1.1 Conduct a walk-through inspection with the Owner and Consultant prior to start of work.
 - 3.3.1.2 Any existing damages or defects will be noted, and the Respondent will be required to sign the inspection report indicating acceptance of existing conditions, and state that they will be responsible for repairing any damages arising from work of their Contract.
 - 3.3.1.3 Repair any damages to In-Place Work caused by installation of furniture.
 - 3.3.1.4 Repair or replace damaged components as directed by the Consultant:
 - 3.3.1.4.1 Where damage was caused by a different Subcontractor than the installer, coordinate with the Constructor for payment from responsible parties.
 - 3.3.1.4.2 Damage caused by work of this Contract to other Subcontractors' work shall be repaired by the Subcontractor and paid for by the Subcontractor.
- 3.3.2 Cleaning:
 - 3.3.2.1 Housekeeping:
 - 3.3.2.1.1 Conduct daily housekeeping in the work area and general cleanup on Fridays:
 - The Respondent will provide one man for every ten men on site or a minimum of one man for the general cleanup.
 - The Respondent shall flatten and place all garbage generated by their activities, place in their delivery vehicle and remove from site on a daily basis.
 - 3.3.2.2 Remove grease, dirt, dust, stains, labels, fingerprints and other foreign matter from interior and exterior surfaces; vacuum and dust behind grilles, under desks and in all semi-concealed locations; wash all other surfaces not otherwise finished; clean and polish glass on both sides.
 - 3.3.2.3 Verify that cleaning agents and methods do not remove finishes and permanent protective coatings on surfaces being cleaned.
 - 3.3.2.4 Leave all surfaces in perfectly clean and unsoiled condition. Cleaning in concealed spaces shall consist of vacuum cleaning of all surfaces in affected areas of work only.

3.4 FURNITURE SCHEDULE

<u>Space</u>	<u>Item</u>	<u>Size</u>	<u>Amount</u>
Server Room Aisle	Worktable	24" x 48"	1
Lasercut Aisle	Worktable	24" x 96"	2
North West Workshop	Worktable	24" x 72"	1
	Worktable	24" x 60"	1
South West Workshop	Worktable	24" x 60"	1
	Worktable	30" x 60"	2

END OF SECTION

SECTION 21 1313 – WET-PIPE SPRINKLER SYSTEMS

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 DESCRIPTION OF WORK

- A. The Contractor shall furnish all labor, tools, equipment, services, and transportation necessary for, or reasonably incidental to, the construction and completion order of the fire protection work, including, but not limited to, the following:
 - 1. The installation of an automatic fire sprinkler system complete and ready for operation, for the entire building including but not limited to the mechanical equipment connection to the water main for a fully functional system.
 - 2. Prepare shop drawings, product submittals based on DSA approved design documents and obtain all necessary approvals. Any major changes Contractor to verify existing site conditions and coordinate with other trade before construction work.
 - 3. Sprinkler system shall be monitored by a central alarm monitoring company. This monitoring shall include water flow indicators and tamper switches on all control valves.
 - 4. Provide complete as-built drawings of the fire sprinkler and standpipe system in AutoCAD 2018 version (or higher) using architectural backgrounds. Drawings shall include exact locations of all piping, sprinkler heads, sprinkler control valve assemblies, pipe supports, bracing, etc.
 - 5. Pay for all necessary fees.
 - 6. Painting of exposed piping and supports.
 - 7. Testing and adjusting of completed work, inspections, and instructions. All inspections, testing and maintenance work required by NFPA 25, California 2022 Edition, and recommended by the equipment manufacturer shall be provided. Work shall include operation of sprinkler system alarm and supervisory devices.
 - 8. Repair of all damage done to premises because of this installation and removal of all debris left by those engaged in this installation.
 - 9. Excavation, trenching and backfill required in this section of work.

1.3 RELATED WORK

- A. Division 07, Firestopping
- B. Division 09, Painting.
- C. Division 22, Plumbing.
- D. Division 23, Heating, Ventilating, and Air conditioning (HVAC).
- E. Division 28, Fire Alarm System.
- F. Division 33, Utilities.

1.4 REFERENCES AND STANDARDS

- A. Regulatory compliance: All work performed under this Division shall comply with the latest currently adopted editions of all codes and regulations. The following references and standards are hereby made a part of this Section and work shall conform to applicable requirements herein except as otherwise specified herein or shown on the Drawings.
- B. Codes and Standards: Conform to all applicable codes and standards as stated herein and as described in Division 1, including the following:
 - 1. California Building Code, 2022 Edition.
 - 2. California Fire Code, 2022 Edition.
 - 3. State of California Administrative Code (CAC) Titles 8, 17, 21, 22 and 24.
 - 4. California Electrical Code (CEC), 2022 Edition.
 - 5. Comply with all ADA and California Title 24 requirements for disabled access.
 - 6. Division of State Architect, State of California (DSA).
 - 7. Local Fire Prevention Bureau requirements.
 - 8. Comply with the latest edition of all applicable standards, including ANSI, ASTM, and OSHA.
 - 9. NFPA - National Fire Association Compliance: Install fire protection systems in conformity with the requirements of the currently adopted editions of the following:
 - a. NFPA 13 - Standard for the Installation of Sprinkler Systems
 - b. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
 - c. NFPA 25, California Edition including Amendments, - Standard for the Inspection, Testing and Maintenance of Water Based Fire Protection Systems.
 - d. NFPA 70 - National Electrical Code.
 - e. NFPA 72, 2012 Edition - National Fire Alarm and Signaling Code.
- C. Minimum requirements: The requirements of these Specifications are the minimum that will be allowed, unless such requirements are exceeded by applicable codes or regulations, in which the local regulatory code or regulation requirement shall govern.
- D. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted Authorities Having Jurisdiction and from the Owner's Representative.

1.5 WORK RESPONSIBILITIES

- A. Site Conditions:
 - 1. Examine the drawings and the specifications, survey the existing site conditions, and include necessary allowances in bid proposal.
 - 2. Resolve conflicts with code requirements, site conditions, the work of other trades, or other mechanical contractors.
 - 3. Verify the location of all existing utilities prior to construction and protect from damage.
 - 4. Pay all costs incurred due to damage of existing utilities or other facilities.
- B. Responsibility:
 - 1. Provide complete functioning systems and include all labor, material, associated tools, and transportation required for the system to operate safely and satisfactorily.
 - 2. Provide all work necessary for a complete wet fire protection system regardless of specifically mentioned in the specifications.

3. Coordinate the installation of fire protection items with the schedules for work of other trades and other contractors to prevent delays in total work. Assume responsibility for any cooperative work which must be altered due to lack of proper coordination or failure to make proper provisions in time.
4. Be specifically responsible for ensuring that coordination between the fire sprinkler system work and the fire detection and alarm system work takes place to ensure full awareness of the location of all fire sprinkler system components (including, but not limited to, control valves, flow switches, supervisory switches and alarm bells) requiring connection to the fire detection and alarm system.

1.6 PERMITS, LICENSES, AND INSPECTIONS

- A. Obtain and pay for all permits, fees and inspections required by work under this Section.
- B. Inspections: A pre-test for the EOR and IOR shall be carried out prior to the inspection by the Authority Having Jurisdiction from the start to the finish without any repairs or the test restarts from the beginning. All work shall be regularly inspected by the Authority Having Jurisdiction. Certificates of approval shall be delivered to the Owner's Representative. Be responsible for notifying the authority having jurisdiction when work is ready for inspection.

1.7 DRAWINGS

- A. Drawings indicate general arrangement of piping and equipment. Should it be necessary to deviate from arrangement or location indicated to meet architectural conditions or site conditions, or due to interference with work in other divisions, such deviations as offsets, rises, or drops in piping that may be necessary, whether shown or not, shall be made at contractor's expense.

1.8 COOPERATION WITH OTHER TRADES

- A. Schedule work and cooperate with other divisions to avoid delays, interferences, and unnecessary work, conforming to construction schedule, making installation when and where required. A special effort shall be made to coordinate with the mechanical contractor so as not to block installation of the mechanical systems. The clearances above ceilings on this project are limited and the ductwork is to have the highest priority. All fire sprinkler work is to be coordinated with the mechanical contractor such that the ductwork can be installed in the locations shown on the mechanical drawings. If installed work is later found to interfere with work of other divisions, make all necessary changes at contractor's expense.

1.9 QUALIFICATIONS OF INSTALLERS

- A. Qualifications:
 1. Effective July 1, 2018, a certification card issued by the California State Fire Marshal is required for all fire sprinkler system pipe fitters responsible for installing, altering, or repairing water-based fire protection system. There must be at least one certified fitter per job site.
 2. For the actual installation, and testing of work under this section, use only thoroughly trained and experienced work personnel completely familiar with the items required and the manufacturer's current recommended methods of installation.
 3. In acceptance or rejection of the finished installation, no allowance will be made for lack of skill.

4. The execution of the work shall be in strict accordance with the best practice of the trades, the intent of this specification, and all codes and ordinances.
- B. Contractor's Qualifications: A firm with at least five (5) years of successful installation experience on projects with fire protection systems work similar and of comparable size and scope to that required for this project. The installer shall have performed at least five (5) similar projects in the San Francisco Bay Area. Contractor shall be prepared to submit written evidence of the installer's experience. Installation of all sprinkler piping, and appurtenances shall be done only by a licensed, fire-protection engineering contractor with at least five (5) years' experience in designing and installing sprinkler and standpipe systems. The Contractor shall possess a valid and current State of California C-16 contractor's license and shall have held this license under the currently licensed business name, for a period of not less than five (5) years as of the date of bidding the project and regardless of whether any other license classification is also held. Contractor shall be capable of providing on-site emergency service within four hours of notification. The contractor shall be capable of providing drawings in AutoCAD 2022 version (or higher) format.
- C. Manufacturer's Qualifications: Firms regularly engaged in manufacture of fire protection products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.
- D. Products and Product Listing: All materials and equipment installed as part of this work shall be new and free of defects. All piping components, equipment, valves, and other devices shall be UL listed and/or FM approved for fire sprinkler use.
- E. Welded Joints: Weld in accordance with procedures established and qualified per ANSI B31.2. Each welder and welding operator shall be qualified per the ANSI procedures as evidenced by a copy of a certified ANSI B31.2 qualification test report. Contractor shall conduct the ANSI qualification test. Permits for on-site welding/brazing/soldering shall be obtained from DSA and/or the Authorities Having Jurisdiction.

1.10 QUALITY ASSURANCE

- A. Bring to the Owner Representative's attention prior to installation, any conflicts with other trades which will result in unavoidable contact to the equipment, piping, described herein, due-to inadequate space, etc.
- B. Bring to the Owner Representative's attention any discrepancies between the specifications and field conditions, changes required due to specific equipment selection, etc., prior to installation.
- C. Provide written notification to Owner's Representative a minimum of fourteen (14) days prior to a utility shut down.
- D. Obtain inspection and approval from the Owner's Representative of any installation to be covered or enclosed prior to such closure.
- E. Restoration of Damage: Repair or replace, as directed by Owner's Representative, materials and parts of premises which become damaged as result of installation of work of this Division. Remove replaced parts from premises.

1.11 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this section before, during and after installation and to protect the installed work and materials of all other trades.

- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner's Representative.
- C. Protection of Materials:
 - 1. Protect materials, equipment and apparatus provided under this Division from damage, water, dust, or similar impairment, both in storage and installation until Notice of Completion has been filed. Materials, equipment, or apparatus damaged because of improper storage or protection will be rejected and must be removed from site.
 - 2. Cap openings in pipes with manufactured caps or fittings. Do not use taped caps.
 - 3. Protect premises and work of other Divisions from damage arising out of installation of work of this Division.

1.12 REVIEW OF CONSTRUCTION

- A. The Owner's Representative may review work at any time.
- B. Advise Owner's Representative fourteen (14) calendar days in advance that work is ready for review at following times:
 - 1. Prior to buried work.
 - 2. Prior to concealment of contract items those have been completed.
 - 3. When requirements of Contract have been completed.
 - 4. Prior to installation of suspended dry wall and ceiling.
- C. Do not backfill or conceal work without Owner Representative's consent.
- D. Maintain on job a set of specifications and drawings for use by the Owner's Representative.
- E. Noncompliance: Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required and, after it has been completely inspected and approved, make all repairs and replacements with such materials as are necessary to the approval of the Owner's Representative and at no additional cost to the Owner.

1.13 SYSTEM ACCEPTANCE

- A. Acceptance shall be contingent on:
 - 1. Completion of the installation of all systems required for a complete and functional wet sprinkler system.
 - 2. Submission and acceptance of operating and maintenance data.
 - 3. Completion of pipe and valve identification.
 - 4. Completion of cleaning.
 - 5. Satisfactory operation of all systems for a period of one (1) week.
 - 6. Satisfactory completion of the acceptance tests which shall demonstrate compliance with all performance and technical requirements of the Contract Documents.
 - 7. Submission of as-built drawings.
 - 8. Final inspection and acceptance by DSA (Division of State Architect), Local Fire Prevention Bureau, and Authorities Having Jurisdiction.

1.14 DAMAGE BY LEAKS

- A. Be responsible for damage to any part of the premises caused by leaks in the pipe or equipment installed under applicable section for a period of twelve (12) months from the date of acceptance of the work by the Owner.

1.15 SUBMITTALS

- A. Submit product data in accordance with Division 1 and as follows:
- B. Submittal Requirements:
 - 1. Submit manufacturer's product brochures for all products. Written descriptions of products are not acceptable. Furnish, all at one time, prior to any installation, valid submittal data on material, equipment, and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on equipment schedules. Product submittals shall be bound in a three (3) ring binder, with table of contents and tab set for each system. "Product Submittals" shall match "Operations and Maintenance Manuals".
 - 2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
 - 3. Submittals will be checked for general conformance with the design concept of the project, but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly design and install work.
 - 4. To be valid, all product submittals must:
 - a. Identify project name and location, Contractor's, Subcontractor's, suppliers or manufacturer's name, address, and telephone number.
 - b. Identify manufacturer's name and model numbers.
 - c. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
 - d. Include all pertinent construction, installation, performance, and technical data.
 - e. Have all product data sheets clearly labeled to indicate the individual item being submitted. In addition, all required options and accessories shall be clearly marked.
 - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding equipment tag number.
 - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, and item numbers.
- C. Shop Drawings:
 - 1. General: Prepare and submit plans, sections, details and diagrams to required scales for specified areas. Drawings shall be prepared using AutoCAD 2000 (or higher), format. Drawings shall be coordinated, dimensioned and indicate equipment, pipe, duct, plumbing, and electrical in relation to architectural and structural features. Include minor piping, drains, etc. Indicate exact locations and elevations of valves, piping specialties, access doors, etc.
 - 2. Complete and detailed shop drawings of a scale no smaller than that of the design documents shall be maintained throughout the coordination and construction phase indicating the work of all trades clearly. All equipment including piping, etc. shall clearly identify both top and bottom elevations as well as distances from equipment to established building lines. Coordinate with other trades and field conditions and show dimensions and details including building construction and access for servicing.

3. Use of contract documents for shop drawings is not acceptable. Any changes to the contract documents will be coordinated with the Architect and submitted to the AHJ for approval.
4. Required Drawings: Prepare and submit drawings for all areas and all fire protection work. Scale shall be minimum 1/4" =1'0" in mechanical rooms, and a minimum 1/8"=1'0" elsewhere.
5. Drawings shall be detailed in accordance with NFPA 13, 14 and 20. Shop drawings shall indicate accurate locations of all piping (with all exposed piping clearly designated), sprinkler heads, seismic braces, pipe anchors and hangers, drain locations, inspector test connections, and other apparatus associated with these systems in respect to architectural conditions, structural conditions, lighting layouts, diffuser layouts, plumbing, mechanical, and electrical layouts. Plans shall include necessary engineering features, including hydraulic reference nodes, pipe lengths and pipe diameters as required by the above-named code and standards. Complete, accurate legends for all symbols and abbreviations shall be provided on plans. Drawings shall have the same scale and same sheet size used by the other trades to facilitate coordination. Sprinkler shop drawings shall be coordinated with architectural drawings for head locations. Any wall and ceiling changes occurring prior to the submittal of contractor's shop drawings shall be incorporated into the contractor's detailed design at no additional contract cost.
6. Center of tile installation is mandatory.
7. Hydraulic calculations shall be executed on standard 8-1/2 x 11-inch sheets, conforming to the requirements of NFPA 13, and shall indicate pipe numbers, beginning and end node points, all referenced Shop Drawings, and system demand curves. Calculations shall be accomplished using an approved computer program and shall be bound and indexed in a three-ring binder matching "Product Submittals" and "Operating and Maintenance Manuals".

D. Product Data:

1. General: Manufacturer's specifications, data sheets, certified drawings, and installation instructions. Include physical and performance data such as weights, sizes, capacities, required clearances, performance curves, acoustical characteristics, finishes, color selection, and accessories. Include certified drawings on major equipment such as fire pumps.

E. Submit product data and brochures for, but not limited to the following:

1. Pipe Material and Fittings.
2. Pipe supports including seismic pipe supports.
3. Fire stopping, including listing system numbers and details.
4. Sprinkler heads, each type and model.
5. Spare sprinkler head cabinets.
6. Valves (all types).
7. Water measuring devices.
8. Valve cabinets.
9. Inspector's test alarm modules.
10. Pressure gauges.
11. Water flow switches.
12. Valve supervisory switches.
13. Alarm Bells.
14. Fire department connections.
15. Test header.
16. Pipe, valve, and Identification signs, etc.

1.16 RECORD DRAWINGS

- A. Record of Job Progress: Keep an accurate dimensional record of the "As-built" locations of all work as required. This record shall be kept up to date on prints as the job progresses and shall be always available for inspection. In addition, record drawings are to be used by the Owner's Representative for job review and field inspections.
- B. "As-Built" documentation shall be transmitted to the Owner within ten days after Owner Representative's acceptance of the completed installation. As-built documentation shall include the following (Unless noted elsewhere, furnish number of copies indicated):
 - 1. Two (2) copies shall be provided for each drawing. One (1) copy of final AutoCAD drawing files shall also be provided on CD disk, for each drawing.
 - 2. Four (4) sets of manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
 - 3. Four (4) sets of hydraulic calculations and seismic bracing calculations for each sprinkler system updated to include any changes to the installations which affect the calculations.
 - 4. Four (4) sets of hydrostatic report and NFPA 13 material test certificate for each sprinkler system.
 - 5. Four (4) sets of operation and maintenance data updated to include submittal review comments and any equipment substitutions.
 - 6. Manufacturer's literature, reports and operation and maintenance data shall be in a labeled three (3) ring binder.

1.17 OPERATION AND MAINTENANCE DATA

- A. The installing contractor shall provide:
 - 1. All literature and instructions provided by the manufacturer describing proper operation and maintenance of any equipment and devices installed.
 - 2. Publication titled NFPA 25, **California 2023 Edition**, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- B. Include, but not limited to the following: List of all equipment with Manufacturer's name, model number, and local representative, service facilities and normal channel of supply for each item. O&M manuals shall be bound in a three (3) ring binder, with table of contents and tab set for each system. "Operation and Maintenance Manuals" to match "Product Submittals".
 - 1. System Description: Description of start-up and operating procedures.
 - 2. Controls: Diagrams and description of operating sequence of each system.
 - 3. Equipment: Manufacturer's brochures, ratings, certified shop drawings, lubrication charts and data, parts list with parts numbers. Mark each sheet with equipment identification number and actual installed condition.
 - 4. Materials and Accessories: Manufacturer's brochures parts list with part numbers and lubrication data where applicable. Mark each sheet with equipment identification number or system and location of installation; and to specifically identify which options are provided (in case where data sheet shows multiple options).
 - 5. Certificate of factory tests and code compliance as specified.
 - 6. Recommend preventive maintenance schedule and procedures.

1.18 GUARANTEES

- A. At completion, provide the Owner's Representative a written guarantee, in triplicate, that work has been performed in accordance with Specifications and that Contractor shall replace or repair, to the satisfaction of the Owner's Representative any portion of the work that fails within the guarantee period after final acceptance provided such failure is due to defects in materials Also agree to replace or repair, with like workmanship and any part of the building or equipment installed by other trades but damaged by them in installing their work.
- B. During the guarantee period, make four (4) inspections of the work at three (3) month intervals after final acceptance to check the performance of systems and correct any guaranteed items. Inspections to be made in the presence of the Owner's Representative.
- C. Guarantee in writing all fire protection work for a period of twelve (12) months following date of certificate of final acceptance.
- D. All apparatus shall be built and installed so as to deliver its full rated capacity at the efficiency for which it was designed.
- E. All fire protection and electrical apparatus shall operate at full capacity without objectionable noise or vibration.
- F. The fire protection systems shall provide the performance required at standard operating conditions.
- G. Where a manufacturer's guarantee/warranty exceeds one (1) year, the longer shall govern.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

- A. General: All pipe and fitting shall be new, acceptable to all Authorities Having Jurisdiction.
- B. Plastic piping is NOT ALLOWED.
- C. Whenever changes in sizes occur, make the change with reducing fittings as the use of bushing is NOT ALLOWED.
- D. Pipe
 - 1. 2" and smaller: Schedule 40 black steel pipe conforming to ASTM A135 and A53
 - 2. 2.5" and larger: Schedule 10 black steel pipe conforming to ASTM A 135.
- E. Fittings
 - 1. Grooved coupling and mechanical fittings shall be UL listed or FM approved for fire protection service.
 - 2. Plain-end type pipe fittings and couplings are NOT ALLOWED.
 - 3. Snap-On and Strapless Outlet fittings shall not be permitted.
 - 4. Fittings for Schedule 40 black steel pipe:
 - a. Screwed joints conforming to ANSI/ASME B2.1
 - b. Welded joints conforming to ANSI/ASME B31.1

- c. UL listed mechanical grooved couplings. Grooves may be rolled or cut, and they shall be dimensionally compatible with the couplings.
5. Fittings for Schedule 10 black steel pipe:
- a. Welded joints conforming to ANSI/ ASME B31.1
 - b. UL listed mechanical grooved couplings. Grooves shall be rolled and shall be dimensionally compatible with the couplings.

2.2 SPRINKLER HEADS

- A. The acceptable fire sprinkler head manufacturers are Tyco, Victaulic, Viking and Reliable.
- B. Exposed Structure Ceiling: UL listed, quick response pendent or upright type with brass finish, 1/2" orifice, quick response sprinkler, or equal. Chrome finish in Public Areas.
- C. In Finished Ceilings and Soffits: UL listed, quick response type, 1/2" orifice, with concealed type cover plate assembly, white finish, quick response concealed sprinkler, or equal.
- D. Temperature ratings shall be 155°F. Exception, sprinklers at skylights and electrical room shall be 200°F.
- E. Sprinkler heads as shown in some spaces, may be located closer together than required by code, but are required to maintain an orderly pattern.
- F. Provide spare heads of each temperature rating and type used in a suitable metal cabinet with red enamel finish, cabinet to be located at the direction of Owner's Representative. Number of spare heads in accordance with NFPA 13.
- G. Provide sprinkler head guards, UL listed, and FM approved for sprinkler heads subject to mechanical damage or for any sprinkler head lower than seven feet (7') above the floor, for all heads in all mechanical, electrical and elevator machine rooms. Head guards shall be factory painted red enamel.
- H. For sprinkler heads in exposed areas: Provide sprinkler heads with Teflon coating for corrosion resistance. All sprinkler heads exposed to the outside of the building shall be dry pendent type.
- I. Provide standard coverage heads, extended coverage sprinkler heads are not acceptable.
- J. Escutcheons shall be factory treated to receive paint.

2.3 HANGERS AND SUPPORTS

- A. Hangers and seismic sway bracing shall be designed and installed as required by NFPA 13 and NFPA 14 (including all appendices), and by the California Building Code. Provide steel bracing as to resist earthquake loads, as required for Seismic Zone IV. Specifically, these codes shall be interpreted such that all system components and supports shall be capable of resisting five times the weight of the water filled pipe plus 250 lb. downward; and 0.75 times the weight of the water filled pipe in all other directions. Flexibility, internal pressure, and differential movement between the piping and building shall be allowed for, so that no allowable stress is exceeded in any member.
- B. Hangers and components shall be U.L. listed and/or FM approved. All hanger and support components including seismic sway bracing components shall be of the same manufacturer.

- C. Hanger Rods: Hanger rod size shall be no less than the standard rod sizes listed on the MSS SP-69. Rods shall be steel rods, threaded at ends only with a minimum safety factor of 5 over the imposed load. All thread rods are not acceptable. Where rod stiffeners are required.
- D. Where beam clamps are used, provide beam clamp retaining strap.
- E. Powder-driven and explosive type fasteners are not allowed.
- F. The end sprinkler on a branch line shall be restrained against excessive vertical and lateral movement by use of a wrap-around hook or by other approved means per NFPA 13.
- G. When static pressure exceeds 100 psi, arm over and drops 12 inches and over requires a hanger.
- H. Where beam or joist thickness will not accommodate a fastener of a required length, through bolt with the required diameter of the bolt and washer will be acceptable. All thread rods are not acceptable for the required bolt.

2.4 PIPING IDENTIFICATION

- A. All piping is to be identified as follows: Brady Perma-Code, MSI Marking Services Inc., or equal, pressure sensitive self-sticking pipe markers consisting of pipe content wording and arrow indicating directions of flow on ANSI color background. Arrow and wording are two separate markers which shall be placed immediately adjacent to each other. Provide at each end of each marker, two and one-fourth inch (2-1/4") wide self-sticking clear tape around periphery of pipe or insulation to furthest secure marker. All markers shall be applied to clean surfaces free of dust, grease, oil or any other material which will prevent adhesion. Install after cleaning, painting and insulation is complete. Pipe identification shall comply with ANSI A13.1 "Scheme for the Identification of Piping Systems".
- B. Location and visibility for pipe identification:
 - 1. On all horizontal runs spaced twenty feet (20') maximum but not less than once in each room at entrance and exit of each concealed space.
 - 2. At each riser takeoff.
 - 3. Within one foot (1') of each valve and control device.
 - 4. At every change in directional flow.
 - 5. At every pipe passage through wall, floor and ceiling construction.
 - 6. Where capped piping is provided for future connections, provide legible and durable metal tags indicating symbol identification.
 - 7. At all wall and ceiling access panel/doors.
 - 8. Near major equipment items and other points of origination and termination.
 - 9. Pipe identification of sprinkler branch piping is not required.
 - 10. Attention shall be given to visibility with reference to pipe markings. Where pipelines are located above or below the normal line of vision, the lettering shall be placed below or above the horizontal of the pipe.

C. Color Coding of Piping:

ANSI Color Service	Color of Color Field	Color of Text
Fire Protection Water	Red	White
Fire Sprinkler Water	Red	White

D. Size of Legend Letters:

Outside Diameter of Pipe or Covering	Minimum Length of Color Field	Minimum Size of Text
3/4" to 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"
8" to 10"	24"	2-1/2"
Over 10"	32"	3-1/2"

2.5 SLEEVES AND ESCUTCHEONS

- A. Sleeves: Provide sleeves for all pipes passing through slabs, concrete walls, lath and plaster ceilings (except drop nipples for sprinklers) and partitions. Sleeves shall extend three inches (3") above floors and be flush with walls, ceilings, and partitions. In concrete construction, sleeves shall be set in forms prior to pour. Clearance between sleeves and pipes shall be one inch for pipes up to three and one-half inches two inches (2") for pipe sizes four inches (4") and greater, and three inches (3") for seismic joints.
- B. Sleeve Materials:
1. In concrete slabs and walls: Schedule 40 black steel pipe.
 2. Sleeves through waterproof membranes: Sleeves set in walls and slabs may be either cast iron or steel and shall be provided with a flashing clamp device and corrosion resistant clamping bolts.
- C. Escutcheons: Primer-coated steel set-screw type.

2.6 IDENTIFICATION SIGNS

- A. Seals shall be modular type consisting of interlocking synthetic rubber links shaped to continuously fill the space between the pipe and the opening, zinc galvanized plated bolt and nut, Thunderline Corporation "Link-Seal", Calpico Model CSL Pipe Linx, or with "Link-Seal" WS series steel wall sleeve.

2.7 ACCESS PANELS AND DOORS

- A. Furnish under this Division where shown, and required by Regulatory Agencies and for access of all concealed valves, etc. Doors in this Division shall be from same manufacturer as those specified under Division 08 for identical appearance and keying. Sizes: 24" x 24" inches minimum for ceilings and 12" x 12" minimum for walls. Furnish fire rated doors when located in rated walls and ceilings. Deliver doors for installation under Division 08. Mark each door to accurately establish its location.

2.8 FLEXIBLE, SPRINKLER HOSE FITTINGS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company; Vic-Flex.

- B. Standard: UL 2443 and FM 1637.
- C. Type: Fully stainless steel AH2 flexible hose for connection to sprinkler, and with one-piece open gate "Series AB1" bracket for connection to ceiling grid.
 - 1. The bracket shall allow installation before the ceiling tile is in place.
- D. Bend radius to manufacturer's requirements per hose clearance chart for proper installation in confined spaces.
- E. The hose shall be listed for (4) bends at 31" length. Union joints shall be provided for ease of installation.
- F. Pressure Rating: 175 psig minimum.
- G. Size: Same as connected piping, for sprinkler.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Sprinkler heads in all finished areas shall be installed on a true axis line in both directions with a maximum deviation from the axis line of plus or minus 1/2 inch. At the completion of the installation, if any heads are found to exceed the above-mentioned tolerance, such heads shall be removed and satisfactorily reinstalled. In areas with ceiling tiles, sprinklers shall be installed in the center of tiles.
- B. Locate pipe and sprinkler heads fully coordinated with the engineered diffusers, reflected ceiling plans, ducts, conduits, light fixtures, curtain tracks and all other ceiling elements. Maintain proper code clearances from all ceiling obstructions.

3.2 GENERAL INSTALLATION

- A. Light fixtures and other potential obstructions shall not interfere with the engineered spray patterns of sprinkler heads.
- B. No cutting, drilling, or taping of structural members shall be done without prior written approval of the Owner Representative.
- C. Powder actuated fastening will not be allowed. Embeds, beam clamps, or drilled fasteners will be required, unless otherwise noted.
- D. Provide hydraulic design information signage as required by NFPA 13 and 14.
- E. Install access doors in ceilings of rooms where above ceiling access is required.
- F. Prepare all piping having welds for Fire Marshal inspection prior to installation.

3.3 PIPING INSTALLATION

- A. Carry all exposed and concealed horizontal lines of pipe on specified hangers properly spaced and set to allow the pipe to adjust for expansion and contraction.
- B. Check all piping runs beforehand with all other trades. Run piping to maintain proper clearance for maintenance and to clear opening in exposed area. Run piping in strict coordination with mechanical piping, ducts, and equipment, plumbing work, all electrical conduit and equipment, structural, and architectural conditions. All piping shall be installed within designated finished ceiling height as noted on the architectural drawings.
- C. Install all exposed piping to or at right angles with building walls and tight to walls or ceilings wherever possible. Piping shall be arranged to form a symmetrical pattern. Horizontal piping shall be supported at intervals not to exceed spacing permitted by NFPA 13 & 14. Vertical risers shall be supported at the base and at each floor level with clamps and hangers.
- D. Provide sleeves wherever pipes are run through walls, footings, and slabs, to allow large enough openings for the passage of the pipe. Set sleeves in forms before concrete is poured. Sleeve size shall be not less than a nominal diameter two inches (2") larger than the nominal diameter of piping three and one-half inch (3-1/2") and smaller, and a nominal diameter four inches (4") larger than the nominal diameter of piping four inches (4") and larger. The space between each pipe and sleeve shall be completely closed by packing with code approved mineral fiber materials with a suitable binder or other approved packing material. Piping through rated walls and floors shall be sealed with UL fire rated fireproof material, all in accordance with Fire Marshal's requirements. Pipes through underground exterior walls shall be sealed watertight. Provide link seal protection at sleeves in underground exterior walls and as noted on the drawings.
- E. Firestop all pipes penetrating fire rated construction in with specification Division 07.
- F. Where exposed pipes pass through walls, ceilings, or floors, provide escutcheon plates in all finished rooms and conspicuous locations. Escutcheon plates must be securely held in position allowing enough clearance to allow for expansion and shall be sufficient size to cover the opening around the pipe.
- G. Support all pipes from the building structure so that there is no apparent deflection in pipe runs. Fit piping with steel sway braces and anchors to prevent vibration and/or horizontal displacement under load when required. Do not support pipe from or brace to ducts, other pipes, conduit, or any materials shown on the Drawings. Piping or equipment shall be immobile and shall not be supported or hung by wire, rope, plumber's tape or blocking of any kind.
- H. Arrange riser and piping to maintain minimum clear width at stairways of forty-four inches (44") and minimum headroom of seven feet six inches (7'-6") for all piping.
- I. Do not run piping through elevator hoist way, machine rooms, machinery spaces and enclosures unless piping is serving these spaces. Branch sprinkler piping serving these spaces shall be provided with a supervised branch shut-off valve and flow switch located at an accessible location outside these spaces. Provide supervisory switch on the branch shut-off valve.
- J. Do not run piping through stairways, vaults, electrical rooms and other electrical or electronic equipment spaces and enclosures unless piping is serving these spaces.
- K. Sprinkler piping shall not be installed within the vertical space above electrical switchboards, panel boards, distribution boards, or battery charging panels (refer to California Electrical Code).

- L. Clean pipe and fittings and keep interiors clean throughout installation. Provide caps on ends of cleaned piping.
- M. Where pipe passes through building seismic or movement expansion joints: install flexible connection as manufactured by Metraflex to allow vertical and horizontal movement during an earthquake or ground settlement. Installation methodology shall be in conformance to design building movement for horizontal and lateral displacements.
- N. Use full pipe lengths; random lengths joined by couplings will not be accepted.
- O. Provide allowance for expansion and contraction of all pipes and for seismic movement.
- P. Provide reducing fittings for all changes in pipe size; provide fittings for all changes in pipe direction. Riser piping shall be installed plumb with offset fittings used where alignment adjustment is necessary.
- Q. Provide unions for pipe sizes smaller than two inches (2") and flanged or grooved fittings for sizes two inches (2") and larger to permit.
- R. Provide dielectric fittings where dissimilar piping materials are joined.
- S. Piping arrangement shall avoid beams, columns, ducts, lighting fixtures, doors, windows, and similar obstructions and openings.
- T. Drains, Test Pipes and Accessories: Provide a drain at the base of risers, drain connection on valved sections, and drains at other locations for complete drainage of the system. Provide valve in drain lines and connect to central drain riser. Discharge riser outside over splash block, indirectly over an approved indirect waste receptor as furnished by plumbing section, or as indicated. The main drain shall be capable of discharge test without allowing water to flow onto the floor. If over an indirect waste receptor, verify that receptor is adequately sized to handle flow discharge rate.
- U. Install auxiliary drain valves for lines in accordance with NFPA 13.
- V. The inspector test valve and piping shall be installed in accordance with NFPA 13 and provided at conveniently accessible locations and shall be supplied from the hydraulically remote point. A sight glass with built-in orifice of the appropriate size shall be installed adjacent to each valve. Discharge shall be to the main or to the outside. Location will permit the valve to be opened wide for sufficient time for testing without causing water damage.
- W. The discharge area for the main drain and inspector's test valve shall be protected with a concrete splash pad to prevent damage to landscaping during periodic testing.

3.4 FLUSHING, TESTING, AND ADJUSTING

- A. Test automatic sprinkler system in accordance with NFPA 13.
- B. Perform tests in the presence of authorities having jurisdiction. Provide required labor, materials, equipment, and connections and submit results for review. Repair or replace defective work and pay for restoring or replacing damaged work, due to tests, as directed.
- C. All equipment required for testing, including fittings for additional operating shall be provided by the Contractor.

- D. System Piping Flushing: Underground mains and lead-in connections to system risers shall be completely flushed before connection is made to sprinkler piping. The flushing operation shall be continued for a sufficient time to ensure thorough, cleaning. The minimum flow rate shall be not less than the hydraulically calculated water demand rate of the system including hose requirements, or a flow necessary to provide a velocity of not less than ten (10) feet per second, or the maximum flow rate available to the system under fire conditions. After fire sprinkler piping installation has been completed and before piping is placed in service, flush entire sprinkler system, as required to remove foreign substances, under pressure as specified in NFPA 13 and NFPA 24. Continue flushing until water is clear and check to ensure that debris has not clogged sprinklers. While conducting the flushing operation, the contractor shall exercise care that the water does not create any damage. The contractor shall be responsible for any damage caused by this operation.
- E. Hydrostatic Testing: After flushing system, test fire sprinkler piping hydrostatically as required by NFPA 13 but not less than for period of two (2) hours at two hundred (200) PSIG, or at fifty (50) PSI above maximum static pressure if it is greater than one hundred-fifty (150) PSI. Check system for leakage of joints. Measure hydrostatic pressure at low point of each system or zone being tested.
- F. Repair or replace piping system components as required to eliminate leakage.
- G. Water remaining in normally dry piping shall be evacuated at completion of testing.
- H. All water level sensors, alarm and supervisory signals, tanks and automatic valves shall be performance tested.
- I. The inspection, hydrostatic test and flushing of the sprinkler system shall be witnessed by the Authority Having Jurisdiction, and Owner Representative.
- J. Provisions shall be made for the proper disposal of water used for flushing or testing.
- K. Provide complete adjustment of sensitivity of water flow and supervisory (tamper) switches. Coordinate with Division 28 Contractor.
- L. After the inspection has been approved, the Contractor shall certify in writing the time, date, name and title of the person reviewing the test. This shall also include the description and what portion of the system has been approved.
- M. A complete record shall be maintained of all testing that has been approved and shall be made available at the job site.
- N. Upon completion of the work, all records and certifications approving testing requirements shall be submitted to the Owner Representative before final payment is made.
- O. Defective work or material shall be replaced or repaired, as necessary, and the inspection and test repeated, all at Contractor's cost. Repairs shall be made with new materials.
- P. No part of any work shall be covered until after it is inspected, tested, and approved.

3.5 INSPECTION

- A. After completion of the fire protection installation and at the start of the guarantee period, execute the National Automatic Sprinkler and Fire Control Association, Inc. standard of Inspection Agreement, at no increase in Contract Sum, calling for four (4) inspections of the sprinkler system

during the guarantee year (see "Guarantees"), plus the following maintenance to be performed during the course of the fourth inspection:

1. Operating of all control valves.
 2. Lubrication of operating stems of all control valves.
 3. Operating of electrical alarms.
 4. Cleaning of alarm valves.
 5. Lubrication of Fire Department hose connection inlets.
 6. Main drain test.
- B. Fill out the Inspection Agreement in triplicate after each inspection and send copies to the Owner Representative.

3.6 PROTECTION, CARE, AND CLEANING

- A. Provide adequate means for, and fully protect, all finished parts of the materials and equipment against physical damage from whatever cause during the progress of this work and until completion.
- B. During construction, properly cap all lines and equipment nozzles to prevent entrance of sand, dirt, etc. Protect equipment against moisture, plaster, cement, paint, or other work of other trades by covering it with polyethylene sheets.
- C. Thoroughly clean exterior and interior of piping, equipment, and materials before systems are put into operation. All systems of any nature shall be thoroughly cleaned and flushed of all contaminants such as cuttings, filings, lubricant, rust, scale, grease, solder, flux, welding residue, debris, etc. Any piece of equipment or part of any system which malfunctions or is damaged due to failure or neglect on the part of this Division to observe this paragraph shall be repaired or replaced to the satisfaction of the Owner's Representative by and at the total expense of this Contract.
- D. After installation has been completed, clean all systems.
1. Piping and Equipment: Clean exterior thoroughly to remove rust, plaster, cement, and dirt before insulation is applied.
 2. Piping and Equipment to Be Painted: Clean exterior of piping, and equipment, exposed in completed structure, removing rust, plaster, cement, and dirt by wire brushing. Remove grease, oil, and similar materials by wiping with clean rags and suitable non-toxic solvents. Touch up primer coat as required.
 3. Motors, Pumps and Other Items with Factory Finish: Remove grease and oil and leave surfaces clean and polished.
 4. Chrome or Nickel-Plated Work: Thoroughly polish.
 5. Factory Finished Items: Remove grease and oil and leave surfaces clean and polished.
 6. All code stamps and nameplates shall be protected from damage and must be legible before final inspection.

3.7 PAINTING AND IDENTIFICATION

- A. After completion of hydrostatic tests, all system piping exposed to view in or on the building shall be painted in accordance with Division 09 - Painting.
- B. All valve hand wheels shall be painted red enamel.

- C. Provide pipe, valve, and equipment identification, and signage in accordance with referenced codes and specifications.

3.8 ACCESSIBILITY

- A. The installation of valves, gages, control devices or other specialties requiring reading, adjustment, inspection, repairs, removal, or replacement shall be conveniently and accessibly located with reference to the finished building.

3.9 CLOSING IN OF WORK

- A. Do not allow or cause any work to be covered up or enclosed until inspected, tested, and approved.

3.10 EMERGENCY REPAIRS

- A. The Owner reserves the right to make temporary repairs as necessary to keep equipment in operating condition without either voiding the guarantee bond nor relieving the Contractor of their responsibility during the bonding period.

3.11 CLEANING UP AND REMOVAL OF SCRAP

- A. All trash and scrap shall be cleaned up and removed from the site as the work progresses.

3.12 PRELIMINARY OPERATIONS

- A. The Owner reserves the right to operate portions of the mechanical system on a preliminary basis without voiding the guarantee.

3.13 TRAINING

- A. Provide instruction to the Owner regarding proper use and operation of the system. Training shall include both classroom and "hands-on" sessions and shall occur after final inspection and testing. The location and timing of the training session is to be arranged with the Owner's Representative.
- B. Two weeks prior to scheduled training dates, furnish the Owner's Representative with six (6) bound copies of complete instructions, including catalog cuts, diagrams, drawings, and other descriptive data covering the proper testing, operation, and maintenance of each type of system installed, and the necessary information for ordering replacement parts. In addition, post one (1) copy of complete instructions at the control panel location.
- C. Session shall include detailed training and instructions covering the necessary and recommended testing, operating, and maintenance procedures for each type of system. Session shall include training and instructions covering the emergency operation procedures for each type of system.

END OF SECTION - 21 1313

SECTION 23 0593 – TESTING, ADJUSTING AND BALANCING HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. Record existing system performance.
- B. Balancing Constant-volume air systems:

1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. TABB: Testing, Adjusting, and Balancing Bureau.
- F. TAB Specialist: An entity engaged to perform TAB Work.

1.3 SUBMITTALS

- A. Submittal:
 - 1. Air-Balance Report: Documentation of work performed for ASHRAE 111-2019."
- B. Strategies and Procedures Plan: Within 90 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- C. Certified TAB reports.

1.4 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC, NEBB or TABB.
 - 1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC, NEBB or TABB.
 - 2. TAB Technician: Employee of the TAB contractor and who is certified by AABC, NEBB, or TABB as a TAB technician.
- B. Certify TAB field data reports and perform the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.

2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- C. TAB Report Forms: Use standard TAB contractor's forms approved by Architect.
- D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

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. Prior to demolition the existing air handling system shall be documented for performance. Exiting air volume readings shall be taken at all supply, return and exhaust terminals. Supplementary information of the supply fan performance at the air-handler shall be provided. Information shall include:
 1. Inlet and outlet static pressures.
 2. Total air supply and return.
 3. Motor HP rating and amperage readings.
 4. Assess and report the performance of the system and overall condition.
- C. Examine systems for installed balancing devices, such as test ports, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- D. Examine the approved submittals for HVAC systems and equipment.
- E. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- F. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- G. Examine motorized dampers and verify that they are accessible and their controls are connected and functioning.
- H. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- I. Examine operating safety interlocks and controls on HVAC equipment.
- J. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
 - 1. Minimum procedures shall include coordination and documentation for the Title 24 2022 NRCC-MCH forms as indicated on the Title 24 compliance documents.
 - 2. Such documentation shall include the necessary coordination with the control's contractor.
- B. Complete system-readiness checks and prepare reports. Verify the following:
 - 1. Automatic temperature-control systems are operational.
 - 2. Equipment and duct access doors are securely closed.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in ASHRAE 111-2008, or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", or SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.
 - 1. Comply with requirements in ASHRAE 62.1-2010, Section 7.2.2, "Air Balancing."
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.

- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.
 - 2. Measure fan static pressures as follows to determine actual static pressure:
 - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 - 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 - 4. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 23 Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 - 5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Measure air outlets and inlets without making adjustments.
 - 1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- C. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in the same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 2. Adjust patterns of adjustable outlets for proper distribution without drafts.
- D. Motorized dampers shall initially be fully open when in the unoccupied and occupied modes. Dampers shall close upon command from controls when the space(s) or are unoccupied during scheduled occupied hours. DOAS variable speed drive shall maintain constant static pressure within the ductwork. Air balancer shall witness proper operation of damper sequencing and provide statement of operation in commissioning report. Balance air distribution devices with all motorized dampers fully open.

3.6 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

- A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
1. Measure and record the operating speed, airflow, and static pressure of each fan.
 2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
 3. Check the operation of the drain pan and condensate-drain trap.
 4. Check bearings and other lubricated parts for proper lubrication.
 5. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.
- B. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
1. Compare the indicated airflow of the renovated work to the measured fan airflows and determine the new fan speed and the face velocity of filters and coils.
 2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
 3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If the increase or decrease is 5 percent or less, equipment adjustments are not required.
 4. Balance each air outlet.

3.7 TOLERANCES

- A. Set HVAC system's air flow rates within the following tolerances:
1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
 2. Air Outlets and Inlets: Plus or minus 10 percent.

3.8 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

- B. Status Reports: Prepare at 75% completion of construction progress report 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.

3.9 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.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 - 1. Fan curves.
 - 2. Manufacturers' test data.
 - 3. Field test reports prepared by system and equipment installers.
 - 4. Other information related 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 contractor.
 - 3. Project name.
 - 4. Project location.
 - 5. Architect's name and address.
 - 6. Engineer's name and address.
 - 7. Contractor's name and address.
 - 8. Report date.
 - 9. Signature of TAB supervisor who certifies the report.
 - 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 - 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 - 12. Nomenclature sheets for each item of equipment.
 - 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 - 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 - 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Fan drive settings include settings and percentage of maximum pitch diameter.
 - d. Settings for supply-air, static-pressure controller.
 - e. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
 2. Duct, outlet, and inlet sizes.
 3. Terminal units.
 4. Balancing stations.
 5. Position of balancing devices.
- E. Air-Handling Test Reports: For air-handling units with coils, include the following (as applicable):
1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches, and bore.
 - i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 3. Test Data (Indicated and Actual Values):
 - a. Total air flow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Filter static-pressure differential in inches wg.
 - f. Preheat-coil static-pressure differential in inches wg.
 - g. Cooling-coil static-pressure differential in inches wg.
 - h. Heating-coil static-pressure differential in inches wg.
 - i. Outdoor airflow in cfm.
 - j. Return airflow in cfm.
 - k. Outdoor-air damper position.
 - l. Return-air damper position.
- F. Fan Test Reports: For supply, return, and exhaust fans, include the following:
1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.

- f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Center-to-center dimensions of sheave, and amount of adjustments in inches.
2. Motor Data:
- a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
3. Test Data (Indicated and Actual Values):
- a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
- G. Air-Terminal-Device Reports:
1. Unit Data:
- a. System and air-handling unit identification.
 - b. Location and zone.
 - c. Apparatus used for test.
 - d. Area served.
 - e. Make.
 - f. Number from system diagram.
 - g. Type and model number.
 - h. Size.
 - i. Effective area in sq. ft.
2. Test Data (Indicated and Actual Values):
- a. Air flow rate in cfm.
 - b. Air velocity in fpm.
 - c. Preliminary air flow rate as needed in cfm.
 - d. Preliminary velocity as needed in fpm.
 - e. Final air flow rate in cfm.
 - f. Final velocity in fpm.
 - g. Space temperature in deg F.

3.10 INSPECTIONS

- A. Initial Inspection:
- 1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
 - 2. Check the following for each system:

- a. Measure airflow of at least 10 percent of air outlets.
- b. Verify that balancing devices are marked with final balance position.
- c. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Commissioning Authority.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of the Commissioning Authority.
3. 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.
4. 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."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. 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 contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

END OF SECTION 23 0593

SECTION 23 3113 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Rectangular ducts and fittings.
 - 2. Round ducts and fittings.
 - 3. Sheet metal materials.
 - 4. Sealants and gaskets.
 - 5. Hangers and supports.
 - 6. Seismic-restraint devices.
- B. Related Sections:
 - 1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
 - 2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA-2006 "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article. All supply, return and exhaust ductwork shall be constructed to 2" pressure classification.
- B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7-10, SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical - OSHPD."
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Submittals:
 - 1. Product Data for Prerequisite EQ 1: Documentation indicating that duct system complies with ASHRAE 62.1, Section 5 - "Systems and Equipment."
 - 2. Documentation indicating that duct system complies with ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."
 - 3. Documentation of work performed for compliance with ASHRAE 62.1, Section 7.2.4 - "Ventilation System Start-Up."
 - 4. For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

5. Specialty dust collection materials and installation.
- C. Delegated-Design Submittal:
1. Sheet metal thicknesses.
 2. Joint and seam construction and sealing.
 3. Reinforcement details and spacing.
 4. Materials, fabrication, assembly, and spacing of hangers and supports.
- 1.4 QUALITY ASSURANCE
- A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."
 - B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA-2020 "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA-2006 "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA-2020 "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. McGill AirFlow LLC.

- b. SEMCO Incorporated.
 - c. Sheet Metal Connectors, Inc.
 - d. Spiral Manufacturing Co., Inc.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," using 45° lateral taps and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA-2020 "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
- 1. Galvanized Coating Designation: G60.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Stainless Steel: ASTM A480.
- D. Aluminum Sheets: ASTM B209, alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- E. Extruded Aluminum: ASTM B221, alloy 6063, temper T6.
- F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- G. Tie Rods: Galvanized steel, quantity and size according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.4 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

- B. Two-Part Tape Sealing System:
1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
 2. Tape Width: 3 inches.
 3. Sealant: Modified styrene acrylic.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 7. Service: Indoor and outdoor.
 8. Service Temperature: Minus 40 to plus 200 deg F.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
 10. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Water-Based Joint and Seam Sealant:
1. Application Method: Brush on.
 2. Solids Content: Minimum 65 percent.
 3. Shore A Hardness: Minimum 20.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. VOC: Maximum 75 g/L (less water).
 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 8. Service: Indoor or outdoor.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

2.5 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- G. Trapeze and Riser Supports:
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

2.6 SEISMIC-RESTRAINT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2. Ductmate Industries, Inc.
 - 3. Hilti Corp.
 - 4. Kinetics Noise Control.
 - 5. Mason Industries.
 - 6. TOLCO; a brand of NIBCO INC.
 - 7. Unistrut Corporation; Tyco International, Ltd.
- B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of the ICC Evaluation Service or the Office of Statewide Health Planning and Development for the State of California or an agency acceptable to authorities having jurisdiction.
 - 1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.
- D. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.
- E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or reinforcing steel angle clamped] to hanger rod.
- F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.7 DUST COLLECTION SYSTEM

- A. Supplier: Nordfab or equal clamp-together design using rolled edge design.
- B. Galvanized: ASTM A653 with a G90 rating.
- C. System components shall consist of Quick-Fit Pipe, Sleeves, elbows, and components for a fully functional dust collection ducted system.
- D. Use manufacturers recommended caulking for temperatures below 250°F and sealing o-rings as applicable.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

- A. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 2. Outdoor, Supply-Air Ducts: Seal Class A.
 3. Outdoor, Exhaust Ducts: Seal Class C.
 4. Outdoor, Return-Air Ducts: Seal Class C.
 5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
 6. Unconditioned Space, Exhaust Ducts: Seal Class C.
 7. Unconditioned Space, Return-Air Ducts: Seal Class B.
 8. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
 9. Conditioned Space, Exhaust Ducts: Seal Class B.
 10. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 1. Where practical, install concrete inserts before placing concrete.
 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum interval of 16 feet.

- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 SEISMIC-RESTRAINT-DEVICE INSTALLATION

- A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems." And ASCE/SEI 7-10.
 - 1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 - 2. Brace a change of direction longer than 12 feet.
- B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install cable restraints on ducts that are suspended with vibration isolators.
- E. Install seismic-restraint devices using methods approved by an evaluation service member of the ICC Evaluation Service, the Office of Statewide Health Planning and Development for the State of California or an agency acceptable to authorities having jurisdiction.
- F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.
- G. Drilling for and Setting Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.6 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 DUCT CLEANING

- A. Clean new and existing duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
 - 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
 - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
 - 1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
 - 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- D. Clean the following components by removing surface contaminants and deposits:
 - 1. Air outlets and inlets (registers, grilles, and diffusers).
 - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 - 4. Coils and related components.
 - 5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
 - 6. Supply-air ducts, dampers, actuators, and turning vanes.
 - 7. Dedicated exhaust and ventilation components and makeup air systems.
- E. Mechanical Cleaning Methodology:
 - 1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
 - 2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
 - 3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
 - 4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
 - 5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
 - 6. Provide drainage and cleanup for wash-down procedures.
 - 7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.8 START UP

- A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.9 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel

- B. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.

- C. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm:
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 - c. Velocity 1500 fpm or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

- D. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

- a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
 2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.
 - c. Velocity 1500 fpm or Higher: 45-degree lateral.
- E. General requirements:
1. Verify all dimensions at the site making all field measurements and shop drawings necessary for fabrication and erection of sheet metal work. Dimensions shown are net free areas. Lined ducts shall be fabricated so that new dimensions to inside of lining shall equal the sizes shown on drawings.
 2. Make allowances for beams, pipes or other obstructions in building construction and for work of other trades. Check plans showing work of other trades and consult with Architect in the event of any interference.
 3. Fittings: Manufactured fittings for all exposed ductwork. Use shop fit couplings for all joints.
 4. Low Pressure Ductwork: Sheet metal gauges, transverse joint type and spacing, reinforcing type and spacing, In accordance with latest ASHRAE and SMACNA Schedules for low-pressure ductwork. Figures below are from the SMACNA Manual
 5. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.
 6. Elbows shall be standard radius or square with vanes as shown on Fig 4-2, 3 & 4. Single vanes with $\frac{3}{4}$ " trailing edge are preferred. Adjust the vanes so that the railing edges are parallel with the downstream duct when entering and leaving duct sizes are not equal. Turning vanes used in acoustically lined duct shall use an acoustical noise reduction turning vane.
 7. Offsets & transitions - Fig 4-7, branch connections as illustrated in - Fig 4-1 or as indicated on the plans.
 8. Round laterals - Fig 3-5, straight tees are not acceptable.
 9. Conical tees and wyes- Fig 3-6.
 10. Junctions between ducts: Branch take-off with 45° or 90° tapered spin-in. No branch duct to intersect main duct on bottom.
 11. Seal all longitudinal and transverse duct and plenum joints and field formed seams airtight (Seal Class B) with medium water based, low VOC, pressure duct sealant.
 12. Joints between ducts: Make with beaded sleeve joints. Apply duct sealer to male end. Mechanically fasten with sheet metal screws or pop rivets. Over joint and screw or rivet heads, apply coating of duct sealer.
 13. Supports for ducts and plenums shall be band iron supports according to Section 4.
 14. All ductwork shall be concealed behind finished wall, ceilings or floors unless specifically noted "exposed" on the drawings. Ductwork shown to be exposed shall be installed to provide maximum headroom and/or floor space.
 15. Increase duct sizes gradually, not exceeding 15° divergence wherever possible. Divergence upstream of equipment shall not exceed 30°; convergence downstream shall not exceed 45°.
 16. Access Panels and Doors in Ductwork: Provide in ductwork as indicated and wherever necessary or required for proper access to all instruments, controls, fire and automatic dampers and equipment and for convenient inspection and maintenance. Size as approved by Architect.
 17. Install ductwork of sizes, runs and connections as shown on drawings.
 18. Fabricate ductwork in workman-like manner with airtight joints; presenting smooth surfaces on inside, neatly finished on outside; construct with curves, bends; turning vanes to aid in easy flow of air. Make internal ends of slip joints in directions of air flow.

19. Install ductwork to provide maximum headroom.
20. Adjust ducts to suit local conditions. Alter duct sizes on basis of equal friction where required to facilitate installation.
21. Provide ductwork connected to air-handling equipment or air inlet and outlet devices, with all necessary transformation pieces, flexible fabric connections as required. Secure fabric connectors tightly to fans, casings and ducts. Allow at least 1" slack in connections. Do not paint fabric connectors. Provide galvanized steel weather shield over exterior top and sides of exposed flexible connections.
22. Diagonally or transversely cross break all panels on metal rectangular ducts over 18" in either direction.
23. Avoid penetration of ducts. Provide airtight rubber grommets at unavoidable penetrations of hanger rods.
24. Duct Openings: Provide openings where required to accommodate thermometers, smoke detectors, controllers, etc.
25. Provide pitot tube openings where required for testing of systems: Complete with metal cap with spring device or screw to ensure against air leakage.
26. Where openings are provided in insulated ductwork, install insulation material inside metal ring.

END OF SECTION 23 3113

SECTION 23 3300 – AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manual volume dampers.
 - 2. Turning vanes.
 - 3. Duct accessory hardware.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Submittals:
 - 1. Documentation indicating that units comply with ASHRAE 62.1-2010, Section 5 - "Systems and Equipment."
 - 2. Documentation indicating that duct insulation R-values comply with tables in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air Conditioning."
- C. Shop Drawings: For duct accessories. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances, and method of field assembly into duct systems and other construction. Include the following:
 - a. Special fittings.
 - b. Manual volume damper installations.
 - c. Control damper installations.
 - d. Fire-damper and smoke-damper installations, including sleeves; and duct-mounted access doors.
 - e. Wiring Diagrams: For power, signal, and control wiring.
- D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance Inc.; a division of Mestek, Inc.
 - b. American Warming and Ventilating; a division of Mestek, Inc.
 - c. Flexmaster U.S.A., Inc.
 - d. McGill AirFlow LLC.
 - e. METALAIRE, Inc.
 - f. Nailor Industries Inc.
 - g. Pottorff; a division of PCI Industries, Inc.
 - h. Ruskin Company.
 - i. Vent Products Company, Inc.
 - 2. Standard leakage rating, with linkage outside airstream.
 - 3. Suitable for horizontal or vertical applications.
 - 4. Frames:
 - a. Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch thick.
 - 6. Blade Axles: Galvanized steel.
 - 7. Tie Bars and Brackets: Galvanized steel.
- B. Jackshaft:

1. Size: 1-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.3 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIRE, Inc.
4. SEMCO Incorporated.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

E. Vane Construction: Single.

2.4 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.

- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized.
- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated.
- F. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- G. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operate dampers to verify full range of movement.
 - 2. Inspect locations of access doors and verify that purpose of access door can be performed.
 - 3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
 - 4. Inspect turning vanes for proper and secure installation.

END OF SECTION 23 3300

SECTION 26 01 00 – BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The requirements of the General Conditions and Division 1, General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

- A. Related Work in Other Sections, but not limited to the following:
 - 1. Motors, motor controls and low voltage control wiring that are an integral part of equipment assemblies and heating and ventilation controls.
 - 2. Painting of exposed electrical work.
 - 3. Plumbing controls and low voltage wiring.
 - 4. Fire alarm system and devices.
 - 5. Data network and distribution.
 - 6. Paging/Intercom system and equipment.
 - 7. Commissioning of HVAC equipment and systems and lighting and lighting control systems including training of owner personnel.
- B. Work Included in Contract
 - 1. Provide and install new 120/208V 3 phase, 4 wire electrical distribution system with new distribution panels, and panelboards for a complete system as detailed on drawings
 - 2. Grounding and bonding per NEC.
 - 3. New lighting system and control with LED type fixtures as shown on drawings.
 - 4. Provide complete voice/data system connected to existing campus system per District standards as shown on drawings.
 - 5. Provide wiring and hookup of all electrical equipment specified under other specification sections, such as technology systems, fabrication, mechanical and plumbing equipment.

1.3 CODES AND STANDARDS

- A. In addition to Codes and Standards - Division 1, the following shall apply to this Division:

- National Electrical Code with California amendments
 - California Admin. Code, Titles 17, 19, 24, Part 3.
 - U.L. Electrical Construction Materials List
 - Codes, rules and regulations as specified hereinafter
 - Local city and county agencies
 - California Building Code

1.4 SUBMITTALS

- A. Submittals shall be made in conformance with the General Conditions. The list shall include, for each item, the manufacturer, manufacturer's catalog number, type of class, the rating, capacity, size, etc. Submittals shall include:
1. Panelboards
 2. Conduit & Fittings
 3. Boxes & Covers
 4. Wire & Cable
 5. Wiring Devices
 6. Disconnect Switches
 7. Lighting Fixtures and control
 8. Voice/Data Networking System
- B. Shop Drawings: Submit for approval, detailed construction drawings for each item of fabricated equipment required for the electrical installation. All drawings shall be to scale, fully dimensioned, and provide sufficient detail to clearly indicate the arrangement of the equipment and its component parts. Construction of the equipment shown shall be revised to comply with the drawings and specifications as required by the Architect after review of the shop drawings, and the drawings submitted when requested by the Architect. Shop drawings shall be submitted for the following:
1. Panelboards
 2. Lighting Systems
 3. Voice/Data Networking System
- C. Substitution: Provide substitutions as outlined.

1.5 SUPERVISION OF ELECTRICAL WORK

- A. Contractor shall personally, or through an authorized and competent representative, constantly supervise the work from beginning to completion and final acceptance. So far as possible, keep same foreman and workmen throughout the project duration. Work shall be subject to inspection and approval by Architect. Promptly furnish related information when so requested by Architect.

1.6 EQUIPMENT AND SYSTEMS IDENTIFICATION

- A. General: All panels, terminal cabinets, etc., shall be labeled as to identification and use. In general, equipment shall be identified in accordance with drawings. Identification tags, signs, labels and markers shall comply with OSHA and ANSI requirements.
- B. Nameplates: All equipment, terminal cabinets, panels and systems shall be identified by laminated, 'lamacoid' engraved plastic, white on black plates permanently attached to the equipment. Voltage and phase shall be listed on these plates. Size shall be ¾" inch x 2 ½" with ½" height text or approved equal. Submit samples for review.

- C. All terminal cabinets to have terminal strips (ideal 89-212 or equal) and all wiring shall be tagged with nylon or vinyl marker tape, Brady B-361B, Brady BMP21 series. Submit samples for review.
- D. Directories: Provide for power circuits, typewritten, neatly arranged in numerical order, and permanently fixed inside all new and existing panels.
- E. Provide 'Brother' labelling system on all receptacle and switch covers indicating complete circuit number.
- F. Provide 'Brother' labelling system on all blank cover plates indicating circuit number or low voltage system (i.e. future data, telephone, etc.). Submit samples for review.
- G. Provide 'Brother' labelling system on all fire alarm device covers indicating complete device number. Submit samples for review.
- H. Provide service description etched on cover of all underground pull boxes.

1.7 OPERATING INSTRUCTIONS ON-SITE

- A. At time of occupancy, arrange for manufacturer's representatives to instruct building operating and maintenance personnel in use of any equipment requiring operating and maintenance. Arrange for all personnel to be instructed at one time. Pay all costs for such service (minimum of 4 hours).

1.8 ADJACENT WORK

- A. Coordinate work and complete with others in furnishing and placing this work.
- B. Work to approved shop drawings for work by others and to field measurements as necessary to properly fit the work.
- C. Project adjacent work as necessary; adjacent construction or exposed surfaces or surfaces damaged by use of materials or operations under this Section shall be repaired or replaced as directed by Architect.

1.9 DRAWINGS

- A. The electrical drawings, which constitute an integral part of this contract, shall serve as the working drawings. They indicate diagrammatically the general layout of the complete electrical system, including the arrangement of feeders, circuits, panelboards, service equipment, and other work. Field verifications of scale dimensions taken from the drawings are directed since actual field locations, distances and elevations will be governed by actual field conditions. Review architectural, structural, mechanical and plumbing drawings and adjust work to conform to all conditions indicated thereon. Discrepancies shown on different plans or between plans and actual field conditions, or between plans and specifications, shall promptly be brought to the attention of the Architect for a decision.

1.10 COORDINATION AND COOPERATION

- A. Drawings and specifications are both supplementary and complementary. Taken together, they are intended to define complete working installations of the systems represented, in accordance with approved practice in the trade, and in conformity with all applicable requirements of local jurisdictional offices and officers and codes and enforcing bodies.
- B. It shall be presumed that any bid offered under this Division of the Specifications is based on a careful examination of the job site, and of the plans and specifications; that the person(s) or

firm(s) awarded a contract hereunder is/are experienced and qualified in the type of work represented; that every effort has been made to prepare complete, accurate and correct plans and specifications; and that reasonable diligence will be exercised in planning and scheduling the work to anticipate conflicts and/or detect errors or omissions. All such shall be immediately reported, and proper resolution agreed on between concerned parties before the work affected is performed. If due to lack of diligence, or to incompetence, failure to anticipate such problems shall not create a valid claim for extra costs or charges.

- C. Requirements of other trades, of utility companies, and of fire departments, protective services, communication systems, or other facilities of a utility nature, shall be determined prior to installation of systems, equipment, devices or materials affected by or dependent on such requirements.
- D. Unapproved deviations or changes based on a presumption of error or code violation, or work not suitable for its intended function, may not be accepted.
- E. Nothing herein shall act to prevent or discourage the contractor from suggesting or discussing possible changes in the work where such might be beneficial to the contractor or the owner, or might facilitate the work of this or other trades.
- F. Any work resulting in a claim for a change in the contract price must be approved and fully documented.

1.11 VISIT TO SITE

- A. Visit the project site, take requisite measurements, and verify exact location of buildings, utilities, and other facilities, and obtain such other information as is necessary for an intelligent bid. No allowance will subsequently be made by the Architect or Owner for any error or omission on the part of the bidder in this connection.

1.12 RECORD DRAWINGS

- A. Record of Job Progress: Keep an accurate dimensional record of the "as-built" locations and of all work; all as required. This record shall be kept up-to-date on blue-line prints as the job progresses and shall be available for inspection at all times. It shall be reviewed by inspector prior to each monthly application for payment.
- B. Record of Installation: Refer to Supplementary General Conditions.
- C. Include on "as-built" drawings:
 - 1. Routing of all buried or concealed electrical feeders and conduits.
- D. Upon completion of the work, a completed set of as-built reproducible vellums and electronic file (ACAD 2020) on USB Cd/DVD disk(s) shall be delivered to the Architect.

1.13 GUARANTEE

- A. All work shall be guaranteed for a minimum period of one year from either the official date of completion or from the date of acceptance by the Owner, whichever is the later date. The guarantee period for certain items shall be longer, as indicated in the specification for those items.
- B. Should any trouble develop during the guarantee time due to defective material, faulty workmanship, or non-compliance with plans, specifications, codes or directions of the Owner, Architect, Engineer or Inspector, the Contractor shall furnish all necessary labor and materials to correct the trouble without additional charges.

1.14 COMMISSIONING

- A. Electrical systems including lighting and lighting controls, occupancy sensors, daylight controls, switching systems, exterior lighting controls and uninterruptible power supplies will be commissioned per the requirements specified in Commissioning Requirements.”

END OF SECTION 26 01 00

SECTION 26 05 00 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Electrical identification.
 - 2. Utility company electricity-metering components.
 - 3. Concrete equipment bases.
 - 4. Electrical demolition.
 - 5. Cutting and patching for electrical construction.

1.2 SUBMITTALS

- A. Product Data: For utility company electricity-metering components.
- B. Shop Drawings: Dimensioned plans and sections or elevation layouts and single-line diagram of electricity-metering component assemblies specific to this Project.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Devices for Utility Company Electricity Metering: Comply with utility company published standards.
- C. Comply with NEC.

1.4 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings for electrical supports, raceways, and cable with general construction work.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment that requires positioning before closing in the building.
- C. Coordinate electrical service connections to components furnished by utility companies.
 - 1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for service entrances and electricity-metering components.
- D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.
- E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Slotted-Steel Channel: Flange edges turned toward web, and 9/16-inch- diameter slotted holes at a maximum of 2 inches o.c., in webs. Strength rating to suit structural loading.
- D. Slotted Channel Fittings and Accessories: Recommended by the manufacturer for use with the type and size of channel with which used.
 - 1. Materials: Same as channels and angles, except metal items may be stainless steel.
- E. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
- F. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- G. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.
- H. Expansion Anchors: Carbon-steel wedge or sleeve type.
- I. Toggle Bolts: All-steel springhead type.
- J. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 ELECTRICAL IDENTIFICATION

- A. Identification Device Colors: Use those prescribed by ANSI A13.1, NEC, and these Specifications.
- B. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick.
- C. Tape Markers for Conductors: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters. Brady B-361B, Brady BMP21 series. Submit samples for review.
- D. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
- E. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape compounded for permanent direct-burial service, and with the following features:
 - 1. Not less than 6 inches wide by 4 mils thick.
 - 2. Embedded continuous metallic strip or core.
 - 3. Printed legend that indicates type of underground line.
- F. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch minimum thickness for signs up to 20 sq. in. and 1/8-inch minimum thickness for larger sizes. Engraved legend in black letters on white background.

- G. Warning and Caution Signs: Preprinted; comply with 29 CFR 1910.145, Chapter XVII. Colors, legend, and size appropriate to each application.
 - 1. Interior Units: Aluminum, baked-enamel-finish, punched or drilled for mechanical fasteners.
 - 2. Exterior Units: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate with 0.0396-inch, galvanized-steel backing. 1/4-inch grommets in corners for mounting.
- H. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.3 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

- A. Comply with requirements of electrical power utility company for all new service entrance equipment, raceways and structures.

2.4 CONCRETE BASES

- A. Concrete Forms and Reinforcement Materials: As specified in Section "Cast-in-Place Concrete."
- B. Concrete: 3000-psi, 28-day compressive strength.

2.5 CONCRETE BOXES

- A. Concrete Boxes: Pre-cast reinforced, size and type as shown; Christy, Brooks or approved equal. All underground boxes shall be provided with traffic grade, spring loaded, penta bolts, and steel cover.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, slotted channel system components.
- B. Dry Locations: Steel materials.
- C. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four with, 200-lb minimum design load for each support element.

3.3 SUPPORT INSTALLATION

- A. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- B. Size supports for multiple raceway or cable runs so capacity can be increased by a 25 percent minimum in the future.
- C. Support individual horizontal single raceways with separate, malleable-iron pipe hangers or clamps except use spring-steel fasteners for 1-1/2-inch and smaller single raceways above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- D. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- E. Secure electrical items and their supports to building structure, using the following methods unless other fastening methods are indicated:
 - 1. Wood: Wood screws or screw-type nails.
 - 2. Gypsum Board: Toggle bolts. Seal around sleeves with joint compound, both sides of wall.
 - 3. Masonry: Toggle bolts on hollow block and expansion bolts on solid block. Seal around sleeves with mortar, both sides of wall.
 - 4. New Concrete: Concrete inserts with machine screws and bolts.
 - 5. Existing Concrete: Expansion bolts.
 - 6. Structural Steel: Spring-tension clamps.
 - a. Comply with AWS D1.1 for field welding.
 - 7. Light Steel Framing: Sheet metal screws.
 - 8. Fasteners for Damp, Wet, or Weather-Exposed Locations: Stainless steel.
 - 9. Light Steel: Sheet-metal screws.
 - 10. Fasteners: Select so load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 IDENTIFICATION MATERIALS AND DEVICES

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
- E. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and

communication lines. Locate 6 to 8 inches below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.

- F. Install warning, caution, and instruction signs where required to comply with 29 CFR 1910.145, Chapter XVII, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Indoors install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
- G. Provide service description etched on cover of all underground pull boxes.

3.5 FIRESTOPPING

- A. Apply firestopping to cable and raceway sleeves and other penetrations of fire-rated floor and wall assemblies to restore original undisturbed fire-resistance ratings of assemblies. Firestopping installation is specified in Division 27 Section "Through-Penetration Firestop Systems."

3.6 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated.

3.7 DEMOLITION

- A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.
- B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety including all hardware and supports.
- C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.
- D. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.8 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair, refinish and touch up disturbed finish materials and other surfaces to match adjacent undisturbed surfaces.

END OF SECTION 26 05 00

SECTION 26 05 19 - CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY 1`

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.2 SUBMITTALS

- A. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEC.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 CONDUCTORS AND CABLES

- A. Manufacturers:
 - 1. Alcan Aluminum Corporation; Alcan Cable Div.
 - 2. American Insulated Wire Corp.; a Leviton Company.
 - 3. General Cable Corporation.
 - 4. Senator Wire & Cable Company.
 - 5. Southwire Company.
- B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.
- C. Conductor Material: Copper complying with NEMA WC 5 or 7; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.

- D. Conductor Insulation Types: Type THW, THHN-THWN or XHHW complying with NEMA WC 5 or 7.

2.3 CONNECTORS AND SPLICES

- A. Manufacturers:
 - 1. AMP Incorporated/Tyco International.
 - 2. Hubbell/Anderson.
 - 3. O-Z/Gedney; EGS Electrical Group LLC.
 - 4. 3M Company; Electrical Products Division.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway .
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.
- I. Fire Alarm Circuits: Type THHN-THWN, in raceway.
- J. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- K. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.2 INSTALLATION

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed feeders parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26.
- F. Seal around cables penetrating fire-rated elements according to Section "Through-Penetration Firestop Systems."
- G. Identify and color-code conductors and cables according to Division 26 Section "Basic Electrical Materials and Methods."
- H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- I. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.3 FIELD QUALITY CONTROL

- A. Testing: Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes grounding of electrical systems and equipment. Requirements specified in this Section may be supplemented by requirements of other Sections.

1.2 SUBMITTALS

- A. Product Data: For ground rods.
- B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled under UL 467 as defined in NEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Copperweld Corp.
 - 2. Dossert Corp.
 - 3. Erico Inc.; Electrical Products Group.
 - 4. Galvan Industries, Inc.
 - 5. Harger Lightning Protection, Inc.
 - 6. Hastings Fiber Glass Products, Inc.
 - 7. Heary Brothers Lightning Protection Co.
 - 8. ILSCO.
 - 9. Kearney/Cooper Power Systems.
 - 10. Korns, C. C. Co.; Division of Robroy Industries.
 - 11. Lightning Master Corp.
 - 12. O-Z/Gedney Co.; a business of the EGS Electrical Group.
 - 13. Robbins Lightning, Inc.
 - 14. Salisbury, W. H. & Co.
 - 15. Superior Grounding Systems, Inc.

16. Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 16 Section "Conductors and Cables."
- B. Equipment Grounding Conductors: Insulated with green-colored insulation.
- C. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- F. Bare, Solid-Copper Conductors: ASTM B 3.
- G. Assembly of Bare, Stranded-Copper Conductors: ASTM B 8.
- H. Bare, Tinned-Copper Conductors: ASTM B 33.
- I. Copper Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
- J. Copper Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- K. Tinned-Copper Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- L. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulated spacer.
- M. Connectors: Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items. Exothermic-welded type, in kit form, selected per manufacturer's written instructions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel.
 - 1. Size: 3/4 inches in diameter by 120 inches long.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections.
- D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.
 2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the indicated height above the floor.
- E. Underground Grounding Conductors: Use copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.
- F. Equipment Grounding Conductors: Comply with NEC, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NEC are indicated.
1. Install insulated equipment grounding conductors in feeders.
 2. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
 3. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
 4. Air-Duct Equipment Circuits: Install an insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.
 5. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install an insulated equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.
 6. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location and per Division 27.
 - a. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a grounding bus per Division 27.
 - b. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
 7. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing an insulated equipment grounding conductor with supply branch-circuit conductors.
- G. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
 2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except as otherwise indicated. Make connections without exposing steel or damaging copper coating.

- H. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- I. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers or supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- J. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- K. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
- L. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.
- M. Connections: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
 - 6. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
 - 7. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
 - 8. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
 - 9. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

10. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
 11. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.
- N. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
- O. Connections to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

3.2 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
 2. Test completed grounding system at each location where a maximum ground-resistance level is indicated and at service disconnect enclosure grounding terminal. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
 3. Provide drawings locating each ground rod, ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results. Nominal maximum values are as follows:
 - a. Equipment Rated 500 kVA and Less: 10 ohms.
 - b. Equipment Rated 500 to 1000 kVA: 5 ohms.
 - c. Equipment Rated More Than 1000 kVA: 3 ohms.
 - d. Substations and Pad-Mounted Switching Equipment: 5 ohms.
 - e. Manhole Grounds: 10 ohms.

END OF SECTION 26 05 26

SECTION 26 05 29 - SEISMIC CONTROLS FOR ELECTRICAL WORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes seismic restraints and other earthquake-damage-reduction measures for electrical components. It applies to and complements optional seismic-restraint requirements in the various electrical component Sections of these Specifications.

1.2 DEFINITIONS

- A. Seismic Restraint: A fixed device (a seismic brace, an anchor bolt or stud, or a fastening assembly) used to prevent vertical or horizontal movement, or both vertical and horizontal movement, of an electrical system component during an earthquake.
- B. Mobile Structural Element: A part of the building structure such as a slab, floor structure, roof structure, or wall that may move independently of other structural elements during an earthquake.

1.3 SUBMITTALS

- A. Product Data: Illustrate and indicate types, styles, materials, strength, fastening provisions, and finish for each type and size of seismic-restraint component used. Include documentation of evaluation and approval of components by agencies acceptable to authorities having jurisdiction.
- B. Shop Drawings: For components, physical arrangements, and installation details not defined by Drawings. Indicate materials and show calculations, design analysis, details, and layouts, signed and sealed by a professional engineer.
- C. Pre-approval and Evaluation Documentation: By an agency approved by authorities having jurisdiction, showing maximum ratings of restraints.
- D. Qualification data.
- E. Field quality-control test reports.

1.4 QUALITY ASSURANCE

- A. Comply with seismic-restraint requirements in California Building Code, unless requirements in this Section are more stringent.
- B. Testing Agency Qualifications: An independent testing and inspection agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the inspection indicated.

1.5 PROJECT CONDITIONS

- A. Project Seismic Design Category, and Seismic demands as defined CBC 2019 and ASCE 7-16 Chapter 13.

1.6 COORDINATION

- A. Coordinate layout and installation of seismic bracing with building structure, architectural features, and mechanical, fire-protection, electrical, and other building systems.
- B. Coordinate concrete bases with building structural system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Amber/Booth Company, Inc.
 2. B-Line Systems, Inc.
 3. Erico, Inc.
 4. GS Metals Corp.
 5. Loos & Company, Inc.
 6. Mason Industries, Inc,
 7. Powerstrut.
 8. Thomas & Betts Corp.
 9. Unistrut Corporation.

2.2 MATERIALS

- A. Use the following materials for restraints:
1. Indoor Dry Locations: Steel, zinc plated.
 2. Outdoors and Damp Locations: Galvanized steel.
 3. Corrosive Locations: Stainless steel.

2.3 ANCHORAGE AND STRUCTURAL ATTACHMENT COMPONENTS

- A. Strength: Defined in reports by ICBO Evaluation Service or another agency acceptable to authorities having jurisdiction.
1. Structural Safety Factor: Strength in tension and shear of components shall be at least twice the maximum seismic forces for which they are required to be designed.
- B. Concrete and Masonry Anchor Bolts and Studs: Steel-expansion wedge type.
- C. Concrete Inserts: Steel-channel type.
- D. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.
- E. Welding Lugs: Comply with MSS SP-69, Type 57.
- F. Beam Clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.
- G. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings, and matched to the type and size of anchor bolts and studs used.
- H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to the type and size of attachment devices used.

2.4 SEISMIC-BRACING COMPONENTS

- A. Slotted Steel Channel: 1-5/8-by-1-5/8-inch cross section, formed from 0.1046-inch-thick steel, with 9/16-by-7/8-inch slots at a maximum of 2 inches o.c. in webs, and flange edges turned toward web.
 - 1. Materials for Channel: ASTM A 570, GR 33.
 - 2. Materials for Fittings and Accessories: ASTM A 575, ASTM A 576, or ASTM A 36.
 - 3. Fittings and Accessories: Products of the same manufacturer as channels and designed for use with that product.
 - 4. Finish: Baked, rust-inhibiting, acrylic-enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.
- B. Channel-Type Bracing Assemblies: Slotted steel channel, with adjustable hinged steel brackets and bolts.
- C. Hanger Rod Stiffeners: Slotted steel channels, installed vertically, with internally bolted connections to hanger rod.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install seismic restraints according to applicable codes and regulations and as approved by authorities having jurisdiction, unless more stringent requirements are indicated.
- B. Install structural attachments as follows:
 - 1. Use bolted connections with steel brackets, slotted channel, and slotted-channel fittings to spread structural loads and reduce stresses.
 - 2. Attachments to New Concrete: Bolt to channel-type concrete inserts or use expansion anchors.
 - 3. Attachments to Existing Concrete: Use expansion anchors.
 - 4. Holes for Expansion Anchors in Concrete: Drill at locations and to depths that avoid reinforcing bars.
 - 5. Attachments to Solid Concrete Masonry Unit Walls: Use expansion anchors.
 - 6. Attachments to Hollow Walls: Bolt to slotted steel channels fastened to wall with expansion anchors.
 - 7. Attachments to Wood Structural Members: Install bolts through members.
 - 8. Attachments to Steel: Bolt to clamps on flanges of beams or on upper truss chords of bar joists.
- C. Install electrical equipment anchorage as follows:
 - 1. Anchor panelboards, motor-control centers, motor controls, switchboards, transformers, fused power-circuit devices, control, and distribution units as follows:
 - a. Anchor equipment rigidly to a single mobile structural element or to a concrete base that is structurally tied to a single mobile structural element.

- b. Size concrete bases so expansion anchors will be a minimum of 10 bolt diameters from the edge of the concrete base.
 - c. Bushings for Floor-Mounted Equipment Anchors: Install to allow for resilient media between anchor bolt or stud and mounting hole in concrete.
 - d. Anchor Bolt Bushing Assemblies for Wall-Mounted Equipment: Install to allow for resilient media where equipment or equipment-mounting channels are attached to wall.
 - e. Torque bolts and nuts on studs to values recommended by equipment manufacturer.
- D. Install seismic bracing as follows:
- 1. Install bracing according to spacings and strengths indicated by approved analysis.
 - 2. Expansion and Contraction: Install to allow for thermal movement of braced components.
 - 3. Attachment to Structure: If specific attachment is not indicated, anchor bracing to the structure at flanges of beams, upper truss chords of bar joists, or at concrete members.
- E. Accommodation of Differential Seismic Motion: Make flexible connections in raceways, cables, wireway, cable trays, and busway where they cross expansion- and seismic-control joints, where adjacent sections or branches are supported by different structural elements, and where they terminate at electrical equipment anchored to a different mobile structural element from the one supporting them.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing and inspection agency to inspect seismic-control installation for compliance with indicated requirements.
- B. Testing Agency: Engage a qualified testing and inspection agency to inspect seismic-control installation for compliance with indicated requirements.
- C. Reinspection: Correct deficiencies and verify by reinspection that work complies with requirements.
- D. Provide written report of tests and inspections.

END OF SECTION 26 05 29

SECTION 26 13 00 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets indicated.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEC.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. Alflex Inc.
 - 3. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 4. Electri-Flex Co.
 - 5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
 - 6. LTV Steel Tubular Products Company.
 - 7. Manhattan/CDT/Cole-Flex.
 - 8. O-Z Gedney; Unit of General Signal.
 - 9. Wheatland Tube Co.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Aluminum Rigid Conduit: ANSI C80.5.
- D. IMC: ANSI C80.6.

- E. EMT and Fittings: ANSI C80.3.
 - 1. Fittings: Compression type.(Set screw type not acceptable)
- F. FMC: Aluminum.
- G. LFMC: Flexible steel conduit with PVC jacket.
- H. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers:
 - 1. American International.
 - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 3. Arnco Corp.
 - 4. Cantex Inc.
 - 5. Certainteed Corp.; Pipe & Plastics Group.
 - 6. Condux International.
 - 7. ElecSYS, Inc.
 - 8. Electri-Flex Co.
 - 9. Lamson & Sessions; Carlon Electrical Products.
 - 10. Manhattan/CDT/Cole-Flex.
 - 11. RACO; Division of Hubbell, Inc.
 - 12. Spiralduct, Inc./AFC Cable Systems, Inc.
 - 13. Thomas & Betts Corporation.
- B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.
- C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

2.4 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.
 - 1. Manufacturers:
 - a. Airey-Thompson Sentinel Lighting; Wiremold Company (The).
 - b. Thomas & Betts Corporation.
 - c. Walker Systems, Inc.; Wiremold Company (The).
 - d. Wiremold Company (The); Electrical Sales Division.

- B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color.
 - 1. Manufacturers:
 - a. Butler Manufacturing Co.; Walker Division.
 - b. Enduro Composite Systems.
 - c. Hubbell, Inc.; Wiring Device Division.
 - d. Lamson & Sessions; Carlon Electrical Products.
 - e. Panduit Corp.
 - f. Walker Systems, Inc.; Wiremold Company (The).
 - g. Wiremold Company (The); Electrical Sales Division.
- C. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers:
 - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 - 2. Emerson/General Signal; Appleton Electric Company.
 - 3. Erickson Electrical Equipment Co.
 - 4. Hoffman.
 - 5. Hubbell, Inc.; Killark Electric Manufacturing Co.
 - 6. O-Z/Gedney; Unit of General Signal.
 - 7. RACO; Division of Hubbell, Inc.
 - 8. Robroy Industries, Inc.; Enclosure Division.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- G. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- H. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include

metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

- I. Concrete Boxes: Pre-cast reinforced, size and type as shown; Christy, Brooks or approved equal. All underground boxes shall be provided with traffic grade, spring loaded, penta bolt-down, steel cover.

2.6 FACTORY FINISHES

- A. Finish: For raceway, enclosure, or cabinet components provide manufacturer's standard prime-coat finish ready for field painting.

2.7 FIRESTOPPING FOR LOW VOLTAGE SLEEVES

- A. Firestop Pillows: STI SpecSeal® Brand re-enterable, non-curing, mineral fiber core encapsulated on six sides with intumescent coating contained in a flame retardant poly bag, the following products are acceptable:
 - 1. Specified Technologies Inc. (STI) SpecSeal® Series SSB Pillows.
- B. Fire Rated Cable Pathways: STI EZ-PATH™ Brand device modules comprised of steel raceway with intumescent foam pads allowing 0 to 100 percent cable fill, the following products are acceptable:
 - 1. Specified Technologies Inc. (STI) EZ-PATH™ Fire Rated Pathway.
 - 2. Specified Technologies Inc. (STI) Mini EZ-PATH™ Fire Rated Pathway.

2.8 CABLE TRAY

- A. Steel cable tray shall be ventilated bottom, 4" high X 36" wide or as called out on plans, with rungs spaced at 6" on centers complete with 4" dividers all accessories, fittings, connectors, supports and hardware as recommended/required by the manufacturer.
 - 1. Bline or equal; Series 156-G-06-36; length as shown on plans.

2.9 STRUT-TYPE CHANNEL RACEWAY SYSTEM

- A. Strut-type channel raceway shall be UL listed and identified for electrical use. The material shall be formed hot dipped galvanized steel with corrosion protection complies with section 384.100 (A), (B) and (C) of the NEC.
- B. The system shall be complete with cover, outlet boxes, connectors, closure strip, accessories, spring channel nuts, threaded rods, rod coupling, fittings, end caps, hardware and hanger support manufactured by B-Line, Haydon, Unistrut or equal.
 - 1. Strut-type channel B-Line B22; B22D3 or equal;
 - 2. Strip cover B-Line B217 Series or equal;
 - 3. Outlet box B-Line B516S or equal;
 - 4. End caps B-Line B205 or equal;
 - 5. J-box B-Line B518 series or equal;

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors:

1. Exposed: Rigid steel or IMC.
 2. Concealed: Rigid steel or IMC.
 3. Underground, Single Run: RNC.
 4. Underground, Grouped: RNC.
 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 6. Boxes and Enclosures: NEMA 250, Type 3R.
- B. Indoors:
1. Exposed: EMT.
 2. Concealed: EMT.
 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
 4. Damp or Wet Locations: Rigid steel conduit.
 5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.
 6. Strut-type channel raceway.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 2. EMT fittings - Steel compression connectors and coupling; OZ/Gedney 6000S/7000s deries or equal. Set screw connectors and coupling not allowed.
 3. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.
 4. For Outdoor Use – conduit hub, NEMA 4 for conduit connection/terminating to cabinet/panel/boxes.
 5. All connectors to be steel. Die cast connectors are not acceptable.
- E. Do not install aluminum conduits embedded in or in contact with concrete.

3.2 INSTALLATION

- A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."

- D. Install temporary closures to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
 - 1. Install concealed raceways with a minimum of bends in shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.
 - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 - 2. Space raceways laterally to prevent voids in concrete.
 - 3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
- I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
 - 1. Run parallel or banked raceways together on common supports.
 - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- J. Join raceways with fittings designed and approved for that purpose and make joints tight.
 - 1. Use insulating bushings to protect conductors on all raceways 2" and larger.
- K. Tighten set screws of threadless fittings with suitable tools.
- L. Terminations:
 - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- N. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

- O. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NEC.
- P. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- Q. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- R. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- S. Set floor boxes level and flush with finished floor surface.
- T. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 13 00

SECTION 26 24 20 - DISTRIBUTION BOARD AND PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Bus configuration, current, and voltage ratings.
 - c. Short-circuit current rating of panelboards and overcurrent protective devices.
 - d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 2. Wiring Diagrams: Power, signal, and control wiring.
 - 3. Field quality-control test reports.
 - 4. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
 - a. Eaton Corporation; Cutler-Hammer Products.
 - b. General Electric Co.; Electrical Distribution & Protection Div.

- c. Siemens Energy & Automation, Inc.
- d. Square D.

2.2 MANUFACTURED UNITS

- A. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1.
 - 1. Rated for environmental conditions at installed location.
 - a. Outdoor Locations: NEMA 250, Type 3R.
 - b. Kitchen Areas: NEMA 250, Type 4.
 - c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
- B. Phase and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- C. Conductor Connectors: Suitable for use with conductor material.
 - 1. Ground Lugs and Bus Configured Terminators: Compression type.
- D. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.
- E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices. Provide 20% space in all panelboards
- F. Panelboard Short-Circuit Rating:
 - 1. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.3 DISTRIBUTION PANELBOARDS

- A. Doors: Secured with vault-type latch with tumbler lock; keyed alike. Omit for fused-switch panelboards.
- B. Main Overcurrent Protective Devices: Circuit breaker.
- C. Branch Overcurrent Protective Devices:
 - 1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
 - 2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units. No tie-handle allowed for multi-pole breakers.
- B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. GFCI Circuit Breakers: Single- and two-pole configurations with 30-mA trip sensitivity.
 - 3. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
 - a. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - b. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
 - c. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

2.6 ACCESSORY COMPONENTS AND FEATURES

- A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Fungus Proofing: Permanent fungicidal treatment for panelboard interior, including overcurrent protective devices and other components for all NEMA 3R panelboards.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Comply with mounting and anchoring requirements specified in Division 16 Section "Seismic Controls for Electrical Work."
- C. Mount top of trim 74 inches above finished floor, unless otherwise indicated.
- D. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- E. Install overcurrent protective devices and controllers.
 - 1. Set field-adjustable switches and circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.
- G. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.
- H. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods."
- I. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

- J. Ground equipment according to Division 26 Section "Grounding and Bonding."
- K. Connect wiring according to Division 26 Section "Conductors and Cables."

3.2 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION 26 24 20

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Single and duplex receptacles, ground-fault circuit interrupters.
 - 2. Single- and double-pole snap switches and dimmer switches.
 - 3. Device wall plates.
 - 4. Floor service outlets, poke-through assemblies and multioutlet assemblies.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEC.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Wiring Devices:
 - a. Bryant Electric, Inc./Hubbell Subsidiary.
 - b. Eagle Electric Manufacturing Co., Inc.
 - c. Hubbell Incorporated; Wiring Device-Kellems.
 - d. Leviton Mfg. Company Inc.
 - e. Pass & Seymour/Legrand; Wiring Devices Div.
 - 2. Multioutlet Assemblies:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Wiremold Company (The).

3. Poke-Through, Floor Service Outlets and Telephone/Power Poles:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Pass & Seymour/Legrand; Wiring Devices Div.
 - c. Square D/Groupe Schneider NA.
 - d. Thomas & Betts Corporation.
 - e. Wiremold Company (The).

2.2 RECEPTACLES

- A. Straight-Blade and Locking Receptacles: Heavy-Duty grade.
- B. Straight-Blade Receptacles: Hospital grade.
- C. GFCI Receptacles: Straight blade, non-feed-through type, Hospital or Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch deep outlet box without an adapter.

2.3 SWITCHES

- A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.
- B. Snap Switches: Heavy-Duty grade, quiet type.
- C. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.
 1. Switch: 20 A, 120/277-V ac.
 2. Receptacle: NEMA WD 6, Configuration 5-20R.
- D. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters.
 1. Control: Continuously adjustable slider; with single-pole or three-way switching to suit connections.

2.4 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces:
 - a. 0.035-inch thick, satin-finished stainless steel.
 3. Material for Unfinished Spaces: Galvanized steel.
 4. Material for Wet Locations: Cast aluminum with spring-loaded, lockable, lift cover, and listed and labeled for use in "wet locations."

2.5 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Rectangular, solid brass with satin finish.
- D. Power Receptacle: NEMA WD 6, Configuration 5-20R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: See telecommunication specifications for requirements.
- F. Wiremold RFB4-4DB series complete with brackets, devices, corresponding covers and hardware.
- G. Legrand Wiremold 800 series or equal.

2.6 POKE-THROUGH ASSEMBLIES

- A. Description: Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service outlet assembly.
 - 1. Service Outlet Assembly: Flush type with two simplex receptacles and space for two RJ-45 jacks.
 - 2. Size: Selected to fit nominal 4-inch cored holes in floor and matched to floor thickness.
 - 3. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
 - 4. Closure Plug: Arranged to close unused 4-inch cored openings and reestablish fire rating of floor.
 - 5. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors; and a minimum of four, 4-pair, Category 6 voice and data communication cables.

2.7 MULTIOUTLET ASSEMBLIES

- A. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.
- B. Raceway Material: PVC unless otherwise noted
- C. Wire: No. 12 AWG.

2.8 FINISHES

- A. Color:
 - 1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NEC.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices and assemblies level, plumb, and square with building lines.
- B. Install wall dimmers to achieve indicated rating after derating for ganging.
- C. Install unshared neutral conductors on line and load side of dimmers.

- D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates.
- E. Remove wall plates and protect devices and assemblies during painting.
- F. Adjust locations of floor service outlets to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

- A. Comply with Division 26 Section "Basic Electrical Materials and Methods."
 - 1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.
 - 2. Submit samples for approval.

3.3 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding."
- B. Connect wiring according to Division 26 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections:
 - 1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
 - 2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 26 27 26

SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior lighting fixtures with lamps and ballasts.
 - 2. Lighting fixtures mounted on exterior building surfaces.
 - 3. Emergency lighting units.
 - 4. Exit signs.
 - 5. Accessories, including fluorescent fixture dimmers, occupancy sensors and lighting fixture retrofitting.

1.2 SUBMITTALS

- A. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, and finishes. Clearly identify ballast(s) and lamp(s) for each lighting fixture.
- B. Operation and maintenance data.
- C. Submit shop drawings for all light fixture system and control to be generated by the lighting control manufacturer.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEC.
- C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 FIXTURES AND COMPONENTS, GENERAL

- A. Air-Handling Fluorescent Fixtures: For use with plenum ceiling for air return and heat extraction and for attaching an air-diffuser-boot assembly.
 - 1. Air Supply Units: Slots in one or both side trims join with air-diffuser-boot assemblies.
 - 2. Heat Removal Units: Air path leads through lamp cavity.

3. Combination Heat Removal and Air Supply Unit: Heat is removed through lamp cavity at both ends of the fixture door with air supply same as for air supply units.
4. Dampers: Operable from outside fixture for control of return-air volume.
5. Static Fixtures: Air supply slots are blanked off, and fixture appearance matches active units.

2.3 LIGHTING FIXTURES

- A. Fixture : See drawings.

2.4 LAMP BALLASTS

- A. Description: Include the following features, unless otherwise indicated:

1. Designed for type and quantity of lamps indicated at full light output except for emergency lamps powered by in-fixture battery-packs.
2. Externally fused with slow-blow type rated between 2.65 and 3.0 times the line current.
3. Warranted for 5 years to include replacement ballasts and labor cost, plus lamp warranty for at least 2 years for lamps used with ballast.

- B. LED lamps shall include following features:

1. L.E.D. 3000K/3500K/4000k - Philips, CREE or approved equal.
2. Comply with NEMA C82.11.
3. Normal Light Output (NLO) BF 0.87.
4. Sound Rating: A.
5. Total harmonic distortion rating of less than 20 percent according to NEMA C82.11.
6. Transient Voltage Protection: IEEE C62.41, Category A.
7. Listed class P automatic reset thermal protection.
8. Lamp Current Crest Factor: Less than 1.7

- C. Ballasts for dimmer-controlled fixtures shall comply with general and fixture-related requirements above for electronic ballasts and the following features:

1. Dimming Range: 100 to 5 percent of rated lamp lumens.
2. Ballast Input Watts: Can be reduced to 20 percent of normal.
3. Compatibility: Certified by manufacturer for use with specific dimming system indicated.

2.5 EXIT SIGNS

- A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.

- B. Internally Lighted Signs:

1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum of rated lamp life.

- C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - 1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.
 - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - 3. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

2.6 EMERGENCY LIGHTING UNITS

- A. General: Self-contained units complying with UL 924.
 - 1. Battery: Sealed, maintenance-free, lead-acid type with minimum 10-year nominal life and special warranty.
 - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - 3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - 4. Wire Guard: Where indicated, heavy-chrome-plated wire guard protects lamp heads or fixtures.
 - 5. Integral Time-Delay Relay: Holds unit on for fixed interval when power is restored after an outage; time delay permits high-intensity-discharge lamps to restrike and develop adequate output.
 - 6. Provided with self-diagnostic circuitry.

2.7 EMERGENCY LIGHTING FIXTURES

- A. Internal Type: Self-contained, modular, battery-inverter unit factory mounted within fixture body. Comply with UL 924.
 - 1. Emergency Connection: Operate one lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
 - 2. Night Light Connection: Operate one lamp continuously.
 - 3. Test Switch and Light-Emitting-Diode Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
 - 4. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum seven-year nominal life.
 - 5. Charger: Fully automatic, solid-state, constant-current type. Provided with self-diagnostic circuitry.

2.8 LED LAMPS

- A. L.E.D. 3000K/3500K/4000K/5000K as specified - Philips, CREE or approved equal.

2.9 FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 16 Section "Basic Electrical Materials and Methods" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch.
- C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated, 12 gauge.
- E. Wires For Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
- F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

2.10 LIGHTING CONTROL DEVICES

- A. Dimming Controls: Digital type with on/off control; compatible with digital lighting controller having light output and energy input over the full dimming range.
- B. Light Level Sensor: Detect changes in ambient lighting level and provide dimming range of 5 to 100 percent in response to change.
 - 1. Sensor Capacity: At least 40 electronic dimming ballasts.
 - 2. Adjustable Ambient Detection Range: 10 to 100 fc minimum
- C. Occupancy Sensors: Adjustable sensitivity and off delay time range of 5 to 15 minutes.
 - 1. Device Color:
 - a. Wall Mounted: White.
 - b. Ceiling Mounted: White.
 - 2. Occupancy detection indicator.
 - 3. Ultrasonic Sensors: Crystal controlled with circuitry that causes no detection interference between adjacent sensors.
 - 4. Infrared Sensors: With daylight filter and lens to afford coverage applicable to space to be controlled.
 - 5. Combination Sensors: Ultrasonic and infrared sensors combined.
- D. Manufacturer: Steinel IR Quattro or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Support for Fixtures in or on Grid-Type Suspended Ceilings:
 - 1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from fixture corners.

2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
 4. Install at least two independent support rods or wires from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
- C. Suspended Fixture Support: As follows:
1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging. Pendant fixtures shall be free to swing a minimum of 45 degrees from the vertical in all directions without contacting any obstructions. Otherwise, seismic restraints are required.
 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
 4. Continuous Rows: Suspend from cable.
- D. Air-Handling Fixtures: Install with dampers closed and ready for adjustment.
- E. Adjust aimable fixtures to provide required light intensities.
- F. Occupancy sensor and daylighting sensor placement review by factory representative is required before installing sensors.
- 3.2 COMMISSIONING
- A. All electrical power and lighting controls will be commissioned per the requirements of Section 01810, Commissioning Requirements. Contractor is to provide a factory representative to start-up, test and commission all lighting controls.

END OF SECTION 26 51 00