

PROJECT MANUAL

ENCINAL ELEMENTARY SCHOOL ADMINISTRATION BUILDING MODERNIZATION

195 ENCINAL AVENUE, ATHERTON, CA 94027

for

**MENLO PARK CITY SCHOOL DISTRICT
181 ENCINAL AVENUE, ATHERTON, CA 94027**



**DSA FILE: 41-8
DSA APPL: 01-117917
PTN: 68965-36
MPCSD #____
HED PROJ. NO. 2018-03800-000**

**DSA APPROVAL
APRIL 2019**

HED

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PROJECT

ENCINAL ELEMENTARY SCHOOL
ADMINISTRATION BUILDING MODERNIZATION
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(408) 970-9888 Fax: (408) 970-9316

ELECTRICAL (HVAC)

BRK ASSOCIATES, INC.
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01/11/19

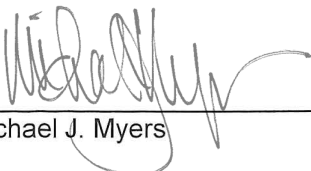
SEALS PAGE

APPROVED
DIV. OF THE STATE ARCHITECT
APP.01-117917 INC:
REVIEWED FOR
SS ☒ FLS ☒ ACS ☒
DATE: 04/03/2019

ARCHITECT

HED

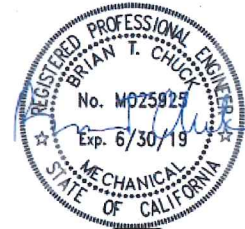
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END OF DOCUMENT

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EXISTING HAZARDOUS MATERIAL INFORMATION

1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. A Hazardous Material Abatement Scope of Work for Project, prepared by North Tower Environmental, Inc., dated December 18, 2018, is available for viewing at the office of Owner.
- C. Related Requirements:
 - 1. Document 00 10 00 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.
 - 2. Section 02 41 19 "Selective Demolition" for notification requirements if materials suspected of containing hazardous materials are encountered.

END OF DOCUMENT

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SECTION 01 11 00
SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 SUMMARY

- A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work under separate contracts.
4. Requirements of Regulatory Agencies.
5. Occupational Safety and Health Act requirements.
6. Coordination of physical space.
7. Coordination with structural requirements.
8. Coordination of site utilities and facilities.
9. Work indicated as NIC.
10. Access to site.
11. Coordination with occupants.
12. Work restrictions.
13. Specification and drawing conventions.

- B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

- A. Project Identification: Encinal Elementary School – Administration Building Modernization.

1. Project Location: 195 Encinal Avenue, Atherton, California 94027.

- B. Owner: Menlo Park City School District, 181 Encinal Avenue, Atherton, CA 94027.

1. Owner's Representative:

Ahmad Sheikholeslami
Director of Facilities and Operations
Menlo Park City School District
Office: 650-321-7140 ext 5614
Mobile: 650-303-6230

- C. Architect: HED; 417 Montgomery Street, Suite 400; San Francisco, California 94104.

- D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents: Refer to Document 00 01 05 - Consultants Page.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of Modernization of the existing Administration Building and miscellaneous site upgrades. The work shall include but is not limited to:
 - 1. Replacement of existing lighting, suspended acoustical ceilings, asbestos plaster ceiling system, drop ceilings, and all related accessories. Replace and modify existing electrical conduits and switches associated with new lighting.
 - 2. Replacement of existing HVAC system.
 - 3. Selective demolition, patch, repair and refinish of areas affected by new work.
 - 4. Replacement of one exterior door with a new storefront window system.
 - 5. Divide existing office into two spaces with non-structural partition.
 - 6. Paint and floor finishes.
- B. Type of Contract:
 - 1. Project will be constructed under a single prime contract.

1.5 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Preceding Work: Owner will award a separate contract for the following construction operations at Project site. Those operations are scheduled to be substantially complete before work under this Contract begins.
 - 1. Hazardous materials abatement.

1.6 REQUIREMENTS OF REGULATORY AGENCIES

- A. Construction shall be in conformance with the California Code of Regulations (CCR), as follows:
 - 1. 2016 California Administrative Code, Part 1, Title 24 C.C.R.
 - 2. 2016 California Building Code (CBC), Part 2, Title 24 C.C.R. (2015 International Building Code Volumes 1-2 and 2016 California Amendments).
 - 3. 2016 California Electrical Code (CEC), Part 3, Title 24 C.C.R. (2014 National Electrical Code and 2016 California Amendments).
 - 4. 2016 California Mechanical Code (CMC) Part 4, Title 24 C.C.R. (2015 IAPMO Uniform Mechanical Code and 2016 California Amendments).
 - 5. 2016 California Plumbing Code (CPC), Part 5, Title 24 C.C.R. (2015 IAPMO Uniform Plumbing Code and 2016 California Amendments).
 - 6. 2016 California Energy Code (CEC), Part 6, Title 24, C.C.R.
 - 7. 2016 California Fire Code (CFC), Part 9, Title 24 C.C.R. (2015 International Fire Code and 2016 California Amendments).
 - 8. 2016 California Existing Building Code (CEBC), Part 10, Title 24 C.C.R.

9. 2016 California Green Building Standards Code (CALGreen), Part 11, Title 24 C.C.R.
 10. 2016 California Referenced Standards, Part 12, Title 24 C.C.R.
 11. Title 19 C.C.R., Public Safety, State Fire Marshal Regulations.
 12. NFPA 13, Standard for the Installation of Sprinkler Systems (CA Amended) (2016 Edition).
 13. NFPA 14, Standard for the Installation of Standpipe and Hose Systems (2013 Edition).
 14. NFPA 17, Standard for Dry Chemical Extinguishing Systems (2013 Edition).
 15. NFPA 17A, Standard for Wet Chemical Extinguishing Systems (2013 Edition).
 16. NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection (2016 Edition).
 17. NFPA 22, Standard for Water Tanks for Private Fire Protection (2013 Edition).
 18. NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances (2016 Edition).
 19. NFPA 72-2013, National Fire Alarm and Signaling Code (CA Amended) (2016 Edition).
 20. NFPA 80, Standard for Fire Doors and Other Opening Protectives (2016 Edition).
 21. NFPA 92, Standard for Smoke Control Systems (2015 Edition).
 22. NFPA 253-2006, Standard Method of Test for Critical Radiant Flux of Floor Covering Systems.
 23. NFPA 2001-2012, Standard on Clean Agent Fire Extinguishing Systems Using a Radiant Heat Energy Source (2015 Edition).
 24. UL 300, Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Equipment (2005 Edition; Rev. 2010).
 25. UL 464, Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories (2003 Edition).
 26. UL 521, Standard for Heat Detectors for Fire Protective Signaling Systems (1999 Edition; Rev. 2005).
 27. 2010 ADA Standards for Accessible Design (for information only).
- B. A copy of CCR Title 24 Parts 1 through 5 shall be kept at the Project site during construction.
- C. Accessibility Requirements: Construction shall be in conformance with the 2010 ADA Standards for Accessible Design.

1.7 OCCUPATIONAL SAFETY AND HEALTH ACT REQUIREMENTS

- A. During the entire construction period, it shall be the responsibility of the Contractor to maintain conditions at the Project site so as to meet in all respects the requirements of the California Code of Regulations, Title 8, Industrial Relations, Chapter 4, Div. of Industrial Safety.
- B. Asbestos Free Materials: Materials containing asbestos shall not be used. Comply with requirements of the Environmental Protection Agency (EPA), 16 CFR 1305 dated 1978, and other governmental agencies having jurisdiction.

1.8 COORDINATION OF PHYSICAL SPACE

- A. Coordinate use of physical space and sequence of installation of mechanical work, specifically electrical work, and plumbing which is indicated diagrammatically on the Drawings. Follow routing indicated as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building. Coordinate work of the various trades to assure efficient and orderly utilization of space available.
- B. The Contractor's attention is directed to the need of special coordination and efficient use of the available physical space between the top of ceiling framing and bottom of the roof framing on all buildings.
- C. In finished areas, except as indicated otherwise, conceal pipes, ducts, and conduits in the construction. Coordinate location of fixtures and outlets with finish elements.

1.9 COORDINATION WITH STRUCTURAL REQUIREMENTS

- A. The placement of pipes, conduits, other materials, and the location, size and reinforcement of holes in the building structure shall conform to the Drawings and Specifications. When the requirements of the Plumbing, Electrical or other sections of the Specifications or Drawings are in conflict with the structural requirements, the structural requirements shall take precedence. Where the safety of the building structure is threatened, due to mechanical, electrical or other work or holes required for such work, modifications shall be made as directed by the Architect.
- B. It is the Contractor's responsibility to coordinate the Work so as to minimize conflicts and optimize efficiency.

1.10 COORDINATION OF SITE UTILITIES AND FACILITIES

- A. Coordinate the work and sequence of installation of the various utilities and facilities. Coordinate connection of utility systems with public agencies and other trades. Comply with requirements of governing agencies and regulations. Notify Architect of any conflict and make modifications as directed by Architect.

1.11 WORK INDICATED AS NIC

- A. The term "NIC" shall be construed to mean that construction work not to be furnished, installed or performed by the Contractor. The term shall mean "Not in this Contract" or "Not a Part of the Work to be performed by the Contractor" except that coordination and installation of certain NIC items specified shall be the Contractor's responsibility.
- B. "NIC" work is indicated on the Drawings and specified herein as an aid to the Contractor in scheduling the amount of time and materials necessary for the completion of the Contract.

1.12 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Use of Site: Limit use of Project site to Work in areas within the Contract limits indicated. Do not disturb portions of the Project site beyond areas in which the Work is indicated.
 - 1. Limits: Confine construction operations to Building B (Administration Building) and designated site areas adjacent to Building B as indicated on the drawings.
 - 2. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.13 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy site and existing adjacent building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
 - 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

1.14 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 8:00 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated.
 - 1. Weekend Hours: Comply with restrictions on times permitted for weekend work per District and local ordinance.
 - 2. Early Morning Hours: Comply with District restrictions or references to regulations by authorities having jurisdiction for restrictions on noisy work.
 - 3. Hours for Utility Shutdowns: Comply with Owner's restrictions.

4. Hours for Noisy Activities: Comply with Owner's restrictions.
- C. Nonsmoking Building: Smoking is not permitted within the buildings or within **25 feet** of entrances, operable windows, or outdoor-air intakes.
- D. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.
- E. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- F. 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.

1.15 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.

END OF SECTION

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SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Requirements:
 - 1. Section 01 60 00 "Materials and Equipment" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

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

1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use facsimile of form provided in Project Manual, attached to this Section 01 25 00.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.

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

1.4 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.

1.5 PROCEDURES

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

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
- 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Requested substitution provides sustainable design characteristics that specified product provided.
 - c. Substitution request is fully documented and properly submitted.
 - d. Requested substitution will not adversely affect Contractor's construction schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution has been coordinated with other portions of the Work.
 - h. Requested substitution provides specified warranty.
 - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Architect will consider requests for substitution if received within 30 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
- a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Requested substitution provides sustainable design characteristics that specified product provided.
 - e. Substitution request is fully documented and properly submitted.
 - f. Requested substitution will not adversely affect Contractor's construction schedule.
 - g. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - h. Requested substitution is compatible with other portions of the Work.
 - i. Requested substitution has been coordinated with other portions of the Work.
 - j. Requested substitution provides specified warranty.
 - k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION

01/11/19

SUBSTITUTION REQUEST FORM

Note: Failure to complete this form with complete and accurate information in a timely manner will nullify any request for substitution.

TO: _____

PROJECT: _____

We hereby submit for your consideration the following product(s), material(s), and/or detail(s) instead of the specified item per the contract documents for the above indicated project and the following specified reference:

ITEM	DESCRIPTION	SPEC SECTION	SPEC PARA	DRAWINGS

Proposed Substitution: _____

- A. Attach complete technical data, including laboratory tests, if applicable.
- B. Include complete information on changes to Drawings and/or Specifications, which proposed substitution would require for its proper installation.
- C. Submit with this request all necessary samples and substantiating data to prove equal quality and performance to that which is specified. Clearly mark manufacturer's literature and test reports to indicated equality in performance.

Fill in blanks below:

- A. Does the proposed substitution affect dimensions indicated on Drawings?

Yes ___ No ___ Explanation: _____

- B. Will the undersigned pay for changes to the building design, including design, engineering and processing costs caused by the proposed substitution?

Yes ___ No ___ Explanation: _____

- B. Does the proposed substitution have an effect on other trades?

Yes ___ No ___ Explanation: _____

- C. Does the proposed substitution have an affect on applicable code requirements?

Yes ___ No ___ Explanation: _____

- D. Outline differences between proposed substitution and specified item:

E. Are the manufacturer's guarantees of the proposed substitution the same as the specified item?

Yes ____ No ____ Explanation: _____

Is the proposed substitution listed with and conform to the same requirements of the same testing agencies as the specified item, such as ICBO, ASTM, etc.?

Yes ____ No ____ Explanation: _____

.....

**CERTIFICATION OF EQUAL PERFORMANCE AND ASSUMPTION OF LIABILITY
FOR EQUAL PERFORMANCE BY CONTRACTOR**

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item.

Submitted By:

Signature _____ Title _____ Name (print) _____

Firm _____ Date _____

Address _____ Telephone _____

Remarks: _____

.....

For Use By Design Consultant

_____ Accepted _____ Accepted As Noted _____ Not Accepted

_____ Received Too Late _____ Approved as Alternate – See Bid Form

SECTION 01 31 13

COORDINATION AND PROJECT MEETINGS

PART 1 - GENERAL

1.1. SECTION INCLUDES

- A. Coordination Responsibilities of the Contractor.
- B. Preconstruction Conference.
- C. Progress Meetings.
- D. Pre-Installation Conferences.

1.2. COORDINATION RESPONSIBILITIES OF THE CONTRACTOR

- A. Coordinate scheduling, submittals, and Work of the Specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Prior to commencement of a particular type or kind of work examine relevant information, contract documents, and subsequent data issued to the Project.
- C. Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Closing up of holes, backfilling, and other covering up operations shall not proceed until all enclosed or covered work and inspections have been completed. Verify before proceeding.
- E. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- G. In locations where several elements of mechanical and electrical work must be sequenced and positioned with precision in order to fit into available space, prepare coordination drawings showing the actual conditions required for the installation. Prepare coordination drawings prior to purchasing, fabricating, or installing any of the elements required to be coordinated.
- H. Closing up of walls, partitions or furred spaces, backfilling, and other covering up operations shall not proceed until all enclosed or covered work and inspections have been completed. Verify before proceeding.
- I. Coordinate completion and clean up of Work of separate sections in preparation for completion and for portions of work designated for District's occupancy.
- J. After District occupancy of Project, coordinate access to Site for correction of defective Work and Work not in accordance with Contract Documents, to minimize

disruption of District's activities.

- K. Coordinate all utility company work in accordance with the Contract Documents.

1.3. PRECONSTRUCTION CONFERENCE

- A. Owner will schedule a conference immediately after receipt of fully executed Contract Documents prior to Project mobilization.
- B. Mandatory Attendance: Inspector of Record, Architect of Record, Contractor, Contractor's Project Manager, and Contractor's Job/Project Superintendent.
- C. Optional Attendance: Architect's consultants, subcontractors, and utility company representatives.
- D. Construction Manager shall preside at conference and shall prepare and record minutes and distribute copies.
- E. Agenda:
 - 1. Execution of District-Contractor Agreement.
 - 2. Issue Notice to Proceed.
 - 3. Submission of executed bonds and insurance certificates.
 - 4. Distribution of Contract Documents.
 - 5. Submission of list of Subcontractors, list of Products, Schedule of Values, and Progress Schedule.
 - 6. Designation of responsible personnel representing the parties.
 - 7. Procedures for processing Construction Directives and Change Orders.
 - 8. Procedures for Request for Information.
 - 9. Procedures for testing and inspecting.
 - 10. Procedures for processing applications for payment.
 - 11. Procedures for Project closeout.
 - 12. Use of Premises.
 - 13. Work restrictions.
 - 14. District's occupancy requirements or options.
 - 15. Responsibility for temporary facilities and controls.
 - 16. Construction waste management and recycling.
 - 17. Parking availability.
 - 18. Office, work and storage areas.
 - 19. Equipment deliveries and priority.
 - 20. Security.
 - 21. Progress cleaning.

1.4. PROGRESS MEETINGS

- A. General Contractor shall schedule and administer meetings throughout progress of the Work at a minimum of every week.
- B. General Contractor will make arrangements for meetings, prepare agenda, and preside at meetings. General Contractor shall record minutes (Field Reports), and distribute copies.
- C. Attendance Required: Project Manager, Job Superintendent, Project Inspector (Inspector of Record), Architect of Record, Subcontractors, and suppliers as appropriate to agenda topics for each meeting.
- D. Agenda:
 - 1. Review minutes of previous meetings. (Field Reports)
 - 2. Safety, and jobsite visits
 - 3. Review of Work progress.

4. Field observations, problems, and decisions.
5. Identification of problems which impede planned progress.
6. Review of submittals schedule and status of submittals.
7. Review of off-site fabrication and delivery schedules.
8. Maintenance of construction schedule.
9. Corrective measures to regain projected schedules.
10. Planned progress during succeeding work period.
11. Coordination of projected progress.
12. Maintenance of quality and work standards.
13. Effect of proposed changes on progress schedule and coordination.
14. Other business relating to Work.

E. District has authority to schedule meetings other than those listed, as necessary.

1.5. PRE-INSTALLATION CONFERENCES

When required in individual specification section, or requested by the District Contractor shall convene a pre-installation conference prior to commencing work of the section. Refer to individual specification section for timing requirements of conference.

- A. Contractor shall require his/her subcontractors and suppliers directly affecting, or affected by, work of the specific section to attend.
- B. Notify the Owner, Inspector of Record, and Architect of Record four (4) days in advance of meeting date.
- C. The pre-installation conference may coincide with a regularly scheduled progress meeting.
- D. Contractor shall prepare agenda, preside at conference, record minutes, and distribute copies within two (2) days after conference to participants.
- E. The purpose of the meeting will be to review Contract Documents, conditions of installation, preparation and installation procedures, and coordination with related work and manufacturer's recommendations.
- F. Pre-installation Schedule: As a minimum, Work being installed under the Contract Documents technical sections will require pre-installation conferences. Contractor shall review the technical specifications and add all additional requirements for pre-installation meetings contained in those sections.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

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SECTION 01 32 16

CONSTRUCTION SCHEDULE - NETWORK ANALYSIS

PART 1 - GENERAL

1.1. REFERENCES

- A. Construction Planning and Scheduling Manual - A Manual for General Contractors and the Construction Industry, The Associated General Contractors of America (AGC).
- B. CSI - Construction Specifications Institute; MP-2-1 Master Format.
- C. U.S. National Weather Service - Local Climatological Data.

1.2. PERFORMANCE REQUIREMENTS

- A. All Contractor's schedules shall comply with the baseline and milestones as indicated in the draft "Program Schedule" furnished by District.
- B. Ensure adequate scheduling during construction activities so Work may be prosecuted in an orderly and expeditious manner within stipulated Contract Time.
- C. Ensure coordination of Contractor and subcontractors at all levels.
- D. Ensure coordination of submittals, fabrication, delivery, erection, installation, and testing of Products, materials and equipment.
- E. Ensure on-time delivery of District furnished Products, materials and equipment.
- F. Ensure coordination of jurisdictional reviews.
- G. Prepare applications for payment.
- H. Monitor progress of Work.
- I. Prepare proper requests for changes to Contract Time.
- J. Prepare proper requests for changes to Construction Schedule.
- K. Assist in detection of schedule delays and identification of corrective actions.

1.3. QUALITY ASSURANCE

- A. Perform scheduling work in accordance with Construction Planning and Scheduling Manual published by the AGC.
- B. Maintain one copy of Construction Planning and Scheduling Manual on Site.
- C. In the event of discrepancy between the AGC publication and the Contract Documents, provisions of the Contract Documents shall govern.

1.4. QUALIFICATIONS

- A. Scheduler:
 - 1. Contractor shall retain a construction scheduler to work in enough capacity to perform all of the Contractor's requirements to prepare the Construction

Schedule. The Scheduler shall plan, coordinate, execute, and monitor a cost/resource loaded critical path method (CPM) schedule as required for Project and have a minimum of five (5) years direct experience using CPM.

2. Scheduler will cooperate with District and shall be available on site for monitoring, maintaining and updating schedules in a timely manner.
3. District has the right to reject the Scheduler based upon a lack of experience as required by this Document or based on lack of performance and timeliness of schedule submittals/fragnets on past projects. Contractor shall within seven (7) calendar days of District's rejection, propose another scheduler who meets the experience requirements stated above.

- B. Administrative Personnel: Five (5) years minimum experience in using and monitoring schedules on comparable projects.

1.5. SUBMITTALS

- A. Adobe "PDF" files are not acceptable.
- B. Submit Short Interval Schedule at each Construction Progress Meeting.
- C. Submit Time Adjustment Schedule within five (5) days of commencement of a claimed delay.
- D. Submit Recovery Schedules as required for timely completion of Work or when demanded by the District.
- E. Submit job cost reports when demanded by the District.
- F. Submit one (1) reproducible and two (2) copies of each schedule and cost report.
- G. Submit large format plotted schedules monthly or at the request of the District.

1.6. REVIEW AND EVALUATION

- A. Contractor shall participate in review of Construction Schedule and Reports with District.
- B. Within seven (7) days of receipt of District comments provide satisfactory revision to Construction Schedule or adequate justification for activities in question.
- C. In the event that an activity or element of Work is not detected by District review, such omission or error shall be corrected by next scheduled update and shall not affect Contract Time.
- D. Acceptance by District of corrected Construction Schedule shall be a condition precedent to making any progress payments.
- E. Cost-loaded values of Construction Schedule shall be basis for determining progress payments.
- F. Review and acceptance by District of Preliminary Work Schedule or Construction Schedule does not constitute responsibility whatsoever for accuracy or feasibility of schedules nor does such acceptance expressly or impliedly warrant, acknowledge or admit reasonableness of activities, logic, duration, manpower, cost or equipment loading stated or implied on schedules.

1.7. FORMAT

- A. Prepare diagrams and supporting mathematical analyses using Precedence

Diagramming Method, under concepts and methods outlined in AGC Construction Planning and Scheduling Manual.

- B. Listings: Reading from left to right, in ascending order for each activity.
- C. Diagram Size: 42 inches maximum height x width required.
- D. Scale and Spacing: To allow for legible notations and revisions.
- E. Illustrate order and interdependence of activities and sequence of Work.
- F. Illustrate complete sequence of construction by activity.
- G. Provide legend of symbols and abbreviations used.

1.8. COST AND SCHEDULE REPORTS

- A. Activity Analysis: Tabulate each activity of network diagram and identify for each activity:
 - 1. Description.
 - 2. Interface with outside contractors or agencies.
 - 3. Number.
 - 4. Preceding and following number.
 - 5. Duration.
 - 6. Earliest start date, earliest finish date.
 - 7. Actual start date, actual finish date.
 - 8. Latest start date, latest finish date.
 - 9. Total and free float.
 - 10. Identification of critical path activity.
 - 11. Monetary value keyed to Schedule of Values.
 - 12. Manpower requirements.
 - 13. Responsibility.
 - 14. Percentage complete.
 - 15. Variance positive or negative.
- B. Cost Report: Tabulate each activity of network diagram and identify for each activity:
 - 1. Description.
 - 2. Number.
 - 3. Total cost.
 - 4. Percentage complete.
 - 5. Value prior to current period.
 - 6. Value this period.
 - 7. Value to date.
- C. Required Sorts: List activities in sorts or groups:
 - 1. By activity number.
 - 2. By amount of float time in order of early start.
 - 3. By responsibility in order of earliest start date.
 - 4. In order of latest start dates.
 - 5. In order of latest finish dates.
 - 6. Application for payment sorted by Schedule of Values.
 - 7. Listing of activities on critical path.
- D. Listing of basic input data which generates schedule.

1.9. CONSTRUCTION SCHEDULE

- A. Contractor shall develop and submit a cost loaded preliminary schedule of construction (or Preliminary Construction Schedule) as required by this Document

and the Contract Documents. It shall be submitted in computer generated network format and shall be organized by Activity Codes representing the Contractor's intended sequencing of the Work, and with time scaled network diagrams of activities. The Preliminary Construction Schedule shall include activities such as mobilization, preparation of submittals, specified review periods, procurement items, fabrication items, milestones, and all detailed construction activities.

- B. Upon District's acceptance of the Preliminary Construction Schedule, Contractor shall update the accepted Preliminary Construction Schedule until Contractor's Construction Schedule is fully developed and accepted. Once approved by District, this shall become the Construction Schedule. This schedule shall include and identify all tasks that are on the Project's critical path with a specific determination of the start and completion of each critical path task, all contract milestones and each milestone's completion date(s) as may be required by the District, and the date of Project Completion. Since updates to the Construction Schedule are the basis for payment to Contractor, submittal and acceptance of the Construction Schedule and updates shall be a condition precedent to making of monthly payments, as indicated in the General Construction Provisions.
- C. Failure to submit an adequate or accurate Preliminary Construction Schedule, Construction Schedule, updates thereto or failure to submit on established dates, will be considered a breach of Contract.
- D. Failure to include any activity shall not be an excuse for completing all Work by required Completion Date.
- E. Activities of long intervals shall be broken into increments no longer than fourteen (14) days or a value over \$20,000.00 unless approved by the District or it is non-construction activity for procurement and delivery.
- F. The Construction Schedule shall comply with the following and include the following:
 - 1. Provide a written narrative describing Contractor's approach to mobilization, procurement, and construction during the first thirty (30) calendar days including crew sizes, equipment and material delivery, Site access, submittals, and permits.
 - 2. Shall designate critical path or paths.
 - 3. Procurement activities to include mobilization, shop drawings and sample submittals.
 - 4. Identification of key and long-lead elements and realistic delivery dates.
 - 5. Construction activities in units of whole days limited to fourteen (14) days for each activity except non-construction, procurement and delivery.
 - 6. Approximate cost and duration of each activity.
 - 7. Shall contain seasonal weather considerations.
 - 8. Indicate a date for Project Completion that is no later than Completion Date subject to any time extensions processed as part of a Change Order.
 - 9. Conform to mandatory dates specified in the Contract Documents.
 - 10. Contractor shall allow for inclement weather in the Proposed Baseline Schedule by incorporating an activity titled "Rain Day Impact Allowance" as the last activity prior to the Completion Milestone. No other activities may be concurrent with it. The duration of the Rain Day Impact Allowance activity will be in accordance with the Contract Documents, including "Computation of Time / Adverse Weather" in Exhibit D, and will be calculated from the Notice to Proceed until the Completion.
 - 11. Level of detail shall correspond to complexity of work involved.
 - 12. Indicate procurement activities, delivery, and installation of District furnished material and equipment.
 - 13. Designate critical path or paths.
 - 14. Subcontractor work at all levels shall be included in schedule.
 - 15. As developed shall show sequence and interdependence of activities

- required for complete performance of Work.
 - 16. Shall be logical and show a coordinated plan of Work.
 - 17. Show order of activities and major points of interface, including specific dates of completion.
 - 18. Duration of activities shall be coordinated with subcontractors and suppliers and shall be best estimate of time required.
 - 19. Shall show description, duration and float for each activity.
- G. Activity. An activity shall meet the following criteria:
- 1. Any portion or element of Work or action that is precisely described, readily identifiable, and is a function of a logical sequential process.
 - 2. Descriptions shall be clear and concise. Beginning and end shall be readily verifiable. Starts and finishes shall be scheduled by logical restraints.
 - 3. Responsibility shall be identified with a single performing entity.
 - 4. Additional codes shall identify building, floor, and CSI classification.
 - 5. Assigned dollar value (cost-loading) of each activity shall cumulatively equal total contract amount. Mobilization, bond and insurance costs shall be separate. General requirement costs, overhead, profit, shall be prorated throughout all activities. Activity costs shall correlate with Schedule of Values.
 - 6. Major construction equipment shall be assigned to each activity.
 - 7. Activities labeled start, continue or completion are not allowed.
- H. Equipment and Materials. For major equipment and materials show a sequence of activities including:
- 1. Preparation of shop drawings and sample submissions.
 - 2. Review of shop drawings and samples.
 - 3. Finish and color selection.
 - 4. Fabrication and delivery.
 - 5. Erection or installation.
 - 6. Testing.
- I. Include a minimum of fifteen (15) days prior to Completion Date for punch lists and clean up. No other activities shall be scheduled during this period.

1.10. SHORT INTERVAL SCHEDULE

- A. The Four-Week Rolling Schedule shall be based on the most recent District Accepted Construction Schedule or Update. It shall include weekly updates to all construction, submittal, fabrication/procurement, and separate Work Contract activities. Contractor shall ensure that it accurately reflects the current progress of the Work.
- B. Shall be fully developed horizontal bar-chart-type schedule directly derived from Construction Schedule.
- C. Prepare schedule on sheet of sufficient width to clearly show data.
- D. Provide continuous heavy vertical line identifying first day of week.
- E. Provide continuous subordinate vertical line identifying each day of week.
- F. Identify activities by same activity number and description as Construction Schedule.
- G. Show each activity in proper sequence.
- H. Indicate graphically sequences necessary for related activities.
- I. Indicate activities completed or in progress for previous two (2) week period.

J. Indicate activities scheduled for succeeding two (2) week period.

K. Further detail may be added if necessary to monitor schedule.

1.11. REQUESTED TIME ADJUSTMENT SCHEDULE

A. Updated Construction Schedule shall not show a Completion Date later than the Contract Time, subject to any time extensions processed as part of a Change Order.

B. If an extension of time is requested, a separate schedule entitled "Requested Time Adjustment Schedule" shall be submitted to District and Architect.

C. Indicate requested adjustments in Contract Time which are due to changes or delays in completion of Work.

D. Extension request shall include forecast of Project Completion date and actual achievement of any dates listed in Contract Documents.

E. To the extent that any requests are pending at time of any Construction Schedule update, Time Adjustment Schedule shall also be updated.

F. Schedule shall be a time-scaled network analysis.

G. Accompany schedule with formal written time extension request and detailed impact analysis justifying extension.

H. Time impact analysis shall demonstrate time impact based upon date of delay, and status of construction at that time and event time computation of all affected activities. Event times shall be those as shown in latest Construction Schedule.

I. Activity delays shall not automatically constitute an extension of Contract Time.

J. Failure of subcontractors shall not be justification for an extension of time.

K. Float is not for the exclusive use or benefit of any single party. Float time shall be apportioned according to needs of project, as determined by the District.

L. Float suppression techniques such as preferential sequencing, special lead/lag logic restraints, extended activity durations, or imposed dates shall not be allowed without the prior written permission of the District.

M. Extensions will be granted only to extent that time adjustments to activities exceed total positive float of the critical path and extends Completion date.

N. District shall not have an obligation to consider any time extension request unless requirements of Contract Documents, and specifically, but not limited to these requirements are complied with.

O. District shall not be responsible or liable for any construction acceleration due to failure of District to grant time extensions under Contract Documents should requested adjustments in Contract Time not substantially comply with submission and justification requirements of Contract for time extension requests.

P. In the event a Requested Time Adjustment Schedule and Time Impact Analysis are not submitted within ten (10) days after commencement of a delay it is mutually agreed that delay does not require a Contract Time extension.

1.12. RECOVERY SCHEDULE

PART 2 - PRODUCTS

2.1 SCHEDULING SOFTWARE

- A. Contractor shall utilize District approved software for scheduling software and shall employ the Critical Path Method (CPM) in the development and maintenance of the Construction Schedule. The scheduling software shall be capable of being resource loaded with manpower, costs and materials. It shall also be capable of generating time-scaled logic diagrams, resource histograms and profiles, bar charts, layouts and reports with any and/or all activity detail.

2.2 ELECTRONIC DATA

- A. Provide compact disk(s) that contain a back-up of the Proposed Baseline Schedule data on it. The electronic P6 files shall be saved in ".XER" type format.

PART 3 – EXECUTION (Not Used)

END OF SECTION

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SECTION 01 33 00

SUBMITTALS

PART 1 - GENERAL

1.1. SUBMITTAL PROCEDURES – USE OF MICROSOFT PROJECT

- A. Contractor shall utilize District-approved software for the submittal process.
- B. Contractor shall transmit each submittal in conformance with requirements of this Document. For each submittal, Contractor shall:
 - 1. Sequentially number the transmittal forms. Resubmitted submittals must have the original number with an alphabetic suffix;
 - 2. Identify Project and Architect's project number, Contractor, Subcontractor or supplier; pertinent Drawing sheet and detail number(s), and specification Section number, as appropriate;
 - 3. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the Work and Contract Documents. Submittals without Contractor's stamp and signature will be returned without review.
- C. Coordinate preparation and processing of submittals with performance of Work. Transmit each submittal sufficiently in advance of performance of Work to avoid delay.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of Work so processing will not be delayed because of the need to review submittals concurrently for coordination.
 - 3. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- D. Comply with Contract Documents for list of submittals and time requirements for scheduled performance of Work.
- E. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.
- F. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- G. Provide space for Contractor and Architect review stamps.
- H. Revise and resubmit submittals as required, identify all changes made since previous submittal.
- I. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.
- J. Submittals not requested will not be recognized or processed. Submittals not requested will be returned without review.

1.2. SHOP DRAWINGS

- A. Do not reproduce Contract Documents or copy standard information as the basis of shop drawings. Standard information prepared without specific reference to the Project is not a shop drawing.
- B. Do not use or allow others to use Shop Drawings which have been submitted and have been rejected.

1.3. ELECTRONIC SUBMITTAL PROCESS

- A. Submittal Procedure for Large Format shop drawings:
 - 1. Contractor shall provide six (6) paper copies and of the large format Shop Drawings directly to the District and the Construction Manager (CM) and Contractor will provide an electronic transmittal (with a detailed description of the submittal including the subject, specification number and number of drawings) using the District approved software/program.
 - 2. Contractor shall verify that the Submittal Schedule and all submittal log(s) are accurate and up to date.
 - 3. The District and Architect will review and markup each Submittal and provide changes to Contractor for Contractor's incorporation into the Submittal.
 - 4. This process will continue until the Contractor has provided a Submittal that is acceptable to the District and the Architect.
 - 5. Once a Submittal is accepted, the District will provide a final accepted Submittal to the Contractor and the Contractor will closeout that one Submittal.
 - 6. Contractor shall send one (1) copy of the completed record submittal of the large format documents to a vendor (Ford Graphics is suggested) and using the District approved software/program.
- B. Product Data, Calculations and Small Format Drawings:
 - 1. Contractor shall upload/post one (1) electronic copy (from manufacturer's website or pre-scanned) of the product literature, data, calculations, and/or small format shop drawings using the District approved software/program with a Transmittal (with a detailed description of the submittal) directly to the CM.
 - 2. The District and Architect will review and markup each Submittal and provide changes to Contractor for Contractor's incorporation into the Submittal.
 - 3. This process will continue until the Contractor has provided a Submittal that is acceptable to the District and the Architect.
 - 4. Once a Submittal is accepted, the District will provide a final accepted Submittal to the Contractor and the Contractor will closeout that one Submittal.
 - 5. Contractor shall send one (1) copy of the completed record submittal of the large format documents to a vendor for scanning and posting using the District approved software/program.
- C. Sample Submittal Procedure – (Product / Assembly Samples):
 - 1. Contractor shall provide four (4) physical samples directly to the District and the CM and Contractor will provide an electronic transmittal (with a detailed description of the submittal including the subject, specification number and number of drawings) using the District approved software/program.
 - 2. The District and Architect will review and markup each Submittal and provide changes to Contractor for Contractor's incorporation into the Submittal.
 - 3. This process will continue until the Contractor has provided a Submittal that is acceptable to the District and the Architect.
 - 4. Once a Submittal is accepted, the District will provide a final accepted Submittal to the Contractor and the Contractor will closeout that one

Submittal.

5. Contractor shall send one (1) copy of the completed record submittal of the large format documents to a vendor (Ford Graphics is suggested) for using the District approved software/program.

1.4 PRODUCT DATA

- A. In addition to the above requirements, mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.

1.5 SAMPLES

- A. In addition to the above requirements, submit samples to illustrate functional and aesthetic characteristics of the Product in accordance with this Document, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- B. Where specific colors or patterns are not indicated, provide materials and products specified in the full range of color, texture and pattern for selection by District. Range shall include standard stocked color/texture/pattern, standard color/texture/pattern not stocked, but available from manufacturer, and special color/ texture/pattern available from manufacturer as advertised in product data and brochures. Unless otherwise indicated in individual specification sections, District may select from any range at no additional cost to District.
- C. Include identification on each sample, with full Project information.
- D. Submit the number of samples that Contractor requires, plus one that will be retained by Architect and one by District.
- E. Reviewed samples which may be used in the Work are indicated in individual specification Sections.

1.6 MANUFACTURER'S INSTRUCTION

- A. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.
- B. Identify conflicts between manufacturers' instructions and Contract Documents.

1.7 MANUFACTURER'S CERTIFICATES

- A. When specified in individual specification Sections, submit manufacturers' certificate to Architect for review, in quantities specified for Product Data.
- B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to District.

1.8 MOCK-UP

- A. Where indicated, provide mock-ups as required. Mock-ups shall be prepared per the specifications and shall accurately and reasonably represent the quality of construction the Contractor will provide. If the mock-up or portions thereof do not adequately represent the quality of the work specified, the Contractor shall modify it

as needed.

- B. Once completed to the District's satisfaction, the mock-up shall serve as the standard of quality for the work.
- C. All mock-ups, at District's option, shall remain the property of the District. If not required by the District, Contractor shall remove and dispose of the mock-up.
- D. Where indicated, on-site mock-ups, if accepted, may be integrated into the Work.

1.9 DEFERRED APPROVAL REQUIREMENTS

- A. Installation of deferred approval items shall not be started until detailed plans, specifications, and engineering calculations have been accepted and signed by the Architect or Engineer in general responsible charge of design and signed by a California registered Architect or professional engineer who has been delegated responsibility covering the work shown on a particular plan or specification and approved by the Division of the State Architect (DSA). Deferred approval items for this Project are as indicated in the Contract Documents.
- B. Deferred approval drawings and specifications become part of the approved documents for the Project when they are submitted to and approved by DSA.
- C. Submit material using electronic submittal process as defined above.
- D. Identify and specify all supports, fasteners, spacing, penetrations, etc., for each of the deferred approval items, including calculations for each and all fasteners.
- E. Submit documents to Architect for review prior to requesting that the Architect forward it to the DSA.
- F. Documents shall bear the stamp and signature of the Structural, Mechanical, or Electrical Engineer licensed in California who is responsible for that work.
- G. Architect and its subconsultants will review the documents only for conformance with design concept. The Architect will then forward the Submittal to DSA for approval.
- H. Contractor shall respond to review comments made by DSA and revise and resubmit submittal to the Architect for re-submittal to DSA for final approval.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

01/11/19

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Commissioning Authority, or authorities having jurisdiction are not limited by provisions of this Section.
 - 4. Specific test and inspection requirements are not specified in this Section.
- C. Related Requirements:
 - 1. Section 01 45 23 "Testing Laboratory Services" for testing laboratory services and inspections.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. 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.
- D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

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

1.6 REPORTS AND DOCUMENTS

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

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

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

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

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

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

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

1.7 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329 and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

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

1.8 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 inspecting they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. 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 33 00 "Submittals."
- D. 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.

- E. 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.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 - 4. Facilities for storage and field curing of test samples.
 - 5. Delivery of samples to testing agencies.
 - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 - 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.9 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 form *DSA-103 Statement of Structural Tests and Special Inspections*, and as specified in Section 01 45 23 "Testing Laboratory Services".

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, IOR's, and Commissioning Authority's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 29 "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

01/11/19

SECTION 01 41 00

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1. DESCRIPTION

- A. This section covers the general requirements for regulatory requirements pertaining to the Work and is supplementary to all other regulatory requirements mentioned or referenced elsewhere in the Contract Documents.

1.2. REQUIREMENTS OF REGULATORY AGENCIES

- A. All statutes, ordinances, laws, rules, codes, regulations, standards, and the lawful orders of all public authorities having jurisdiction of the Work, are hereby incorporated into the Contract Documents as if repeated in full herein and are intended to be included in any reference to Code or Building Code, unless otherwise specified, including, without limitation, the references in the list below. Contractor shall make available at the Site copies of all the listed documents applicable to the Work as the District and/or Architect may request, including, without limitation, applicable portions of the California Code of Regulations (C.C.R.).
- B. This Project shall be governed by applicable regulations, including, without limitation, the State of California's Administrative Regulations for the Division of the State Architect-Structural Safety (DSA/SS), Chapter 4, Part 1, Title 24, C.C.R., and the most current version on the date the Contract is executed and as it pertains to school construction including, without limitation:
 - 1. Test and testing laboratory pursuant to Section 4-335 (District shall pay for the testing laboratory).
 - 2. All special inspections pursuant to Section 4-333(d).
 - 3. Contractor shall submit verified reports pursuant to Section 4-336 & 4-343(c).
 - 4. Administration
 - a. Duties of the Architect and Engineers shall be pursuant to Section and 4-341.
 - b. Duties of Contractor shall be pursuant Section 4-343.
 - c. Verified Reports shall be pursuant to Section 4-336.
 - 5. Contractor shall keep and make available a copy of Part 1 and 2 of the most current version of C.C.R., Title 24 at the Site during construction.
 - 6. Contractor shall notify the Division of State Architect (DSA) upon the start of construction pursuant to Section 4-331.
 - 7. Addenda and Change Orders shall be pursuant to Section 4-338.
- C. Items of deferred approval shall be clearly marked on the first sheet of the Architect's and/or Engineer's approved Drawings. All items later submitted for approval shall be pursuant to Title 24 requirements to the DSA.
- D. Refer to Section 01 11 00 – Summary of Work, Article 1.6 Requirements of Regulatory Agencies.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

01/11/19

SECTION 01 41 19

SITE STANDARDS

PART 1 - GENERAL

1.1. REQUIREMENTS OF THE DISTRICT

- A. Drug-Free Schools and Safety Requirements:
 - 1. No drugs, alcohol, smoking or the use of tobacco products are allowed at any time in any buildings, Contractor-owned vehicles or vehicles owned by others while on District property. No students, staff, visitors, or contractors are to use drugs on these sites.
 - 2. Contractor shall post: "Non-Smoking Area" in a highly visible location on Site. Contractor may designate a smoking area outside of District property within the public right-of-way, provided that this area remains quiet and unobtrusive to adjacent neighbors. This smoking area must be kept clean at all times.
 - 3. Contractor shall ensure that no alcohol, firearms, weapons, or controlled substances enter or are used at the Site. Contractor shall immediately remove from the Site and terminate the employment of any employee(s) found in violation of this provision.
- B. Language: Unacceptable and/or loud language will not be tolerated, "Cat calls" or other derogatory language toward students or public will not be allowed.
- C. Disturbing the Peace (Noise and Lighting):
 - 1. Contractor shall observe the noise ordinance of the Site at all times including, without limitation, all applicable local, city, and/or state laws, ordinances, and/or regulations regarding noise and allowable noise levels.
 - 2. District reserves the right to prohibit the use of radios at the Site, except for handheld communication radios.
 - 3. If portable lights are used after dark, the lights must be located so as not to direct light into neighboring properties.
- D. Traffic:
 - 1. Driving on the Premises shall be limited to periods when students and public are not present. If driving or deliveries must be made during the school hours, two (2) or more ground guides shall lead the vehicle across the area of travel. In no case shall driving take place across playgrounds or other pedestrian paths during recess, lunch, and/or class period changes. The speed limit on-the Premises shall be five (5) miles per hour (maximum) or less if conditions require. Contractor shall not have any deliveries to the Project during the hour before school begins at the Site and during the half hour after school ends at the Site without prior written permission from the Construction Manager or the District.
 - 2. All paths of travel for deliveries, including without limitation, material, equipment, and supply deliveries, shall be reviewed and approved by District in advance.
 - 3. District shall designate a construction entry to the Site. If Contractor requests, District determines it is required, and to the extent possible, District shall designate a staging area so as not to interfere with the normal functioning of school facilities. Location of gates and fencing shall be approved in advance with District and at Contractor's expense.
 - 4. Parking areas shall be reviewed and approved by District in advance. No parking is to occur under the drip line of trees or in areas that could otherwise be damaged.
 - 5. All of the above shall be observed and complied with by the Contractor and all workers on the Site. Failure to follow these directives could result in

individual(s) being suspended or removed from the work force at the discretion of the District. The same rules and regulations shall apply equally to delivery personnel, inspectors, consultants, and other visitors to the Site.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

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SECTION 01 42 00

REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes: Applicability and availability of standards referenced or specified in these specifications.

1.3 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.

1.4 INDUSTRY STANDARDS

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

- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.5 GOVERNMENTAL STANDARDS AND REFERENCES

- A. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans With Disabilities Act (ADA)	(800) 872-2253
	2010 ADA Standards for Accessible Design	(202) 272-0080
	Available from Access Board www.access-board.gov	
CFR	Code of Federal Regulations	(888) 293-6498
	Available from Government Printing Office www.access.gpo.gov/nara/cfr	(202) 512-1530
FS	Federal Specification	(215) 697-6257
	Available from Department of Defense Single Stock Point www.dodssp.daps.mil	
	Available from General Services Administration www.fss.gsa.gov	(202) 501-1021
	Available from National Institute of Building Sciences www.nibs.org	(202) 289-7800

1.6 INDUSTRY ORGANIZATIONS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association www.aluminum.org	(202) 862-5100
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association	(847) 303-5664

	www.aamanet.org	
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists www.aatcc.org	(919) 549-8141
ACI	ACI International (American Concrete Institute) www.aci-int.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AF&PA	American Forest and Paper Association www.afandpa.org	(800) 878-8878
AGA	American Gas Association www.aga.com	(202) 824-7000
AGC	Associated General Contractors of America www.agc.org	(703) 548-3118
AHA	American Hardboard Association (Now part of CPA)	
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	The American Institute of Architects www.aia.org	(800) 242-3837
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400
ISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALCA	Associated Landscape Contractors of America www.alca.org	(800) 395-2522
ALSC	American Lumber Standards Committee www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts	(505) 522-1437

APA	APA-The Engineered Wood Association www.apawood.org	(253) 565-6600
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
ARI	Air Conditioning and Refrigeration Institute www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers www.ashrae.org	(800) 527-4723
ASLA	American Society of Landscape Architects www.asla.org	202/686-2752
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9585
AWCI	AWCI International (Association of the Wall and Ceiling Industries-International) www.awci.org	(703) 534-8300
AWCMA	American Window Covering Manufacturers Association (See WCSC)	
AWI	Architectural Woodwork Institute www.awinet.org	(800) 449-8811
AWPA	American Wood-Preservers' Association www.awpa.com	(334) 874-9800
AWS	American Welding Society www.aws.org	(800) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association www.bia.org	(703) 620-0010

CCC	Carpet Cushion Council www.carpetcushion.org	(203) 637-1312
CDA	Copper Development Association www.copper.org	(800) 232-3282
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CGMI	Ceramic Glazed Masonry Institute www.cgmi.org	(330) 488-1211
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 665-2472
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CPPA	Corrugated Polyethylene Pipe Association www.cppa-info.org	(800) 510-2772
CRA	California Redwood Association www.calredwood.org	(415) 382-0662
CRI	Carpet and Rug Institute www.carpet-rug.com	(800) 882-8846
CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSI	Construction Specifications Institute www.csinet.org	(800) 689-2900
CSSB	Cedar Shake and Shingle Bureau www.cedarbureau.org	(604) 820-7700
CTIOA	Ceramic Tile Institute of America www.ctioa.org	(310) 574-7800
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462
EJMA	Expansion Joint Manufacturers Association www.ejma.org	(914) 332-0040

FCICA	Floor Covering Installation Contractors Association www.fcica.com	(248) 661-5015
FM	Factory Mutual (See FMG)	
FMG	FM Global www.fmglobal.com	(401) 275-3000
GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208
HMA	Hardwood Manufacturers Association www.hmamembers.org	(412) 829-0770
HMMA	Hollow Metal Manufacturers Association (See NAAMM)	
HPVA	Hardwood Plywood and Veneer Association www.hpva.org	(703) 435-2900
IEEE	Institute of Electrical and Electronic Engineers www.ieee.org	(212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
IGMA	Insulating Glass Manufacturers Alliance www.igmaonline.org	(613) 233-1510
ILI	Indiana Limestone Institute of America www.iliai.com	(812) 275-4426
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(702) 567-8150
KCMA	Kitchen Cabinet Manufacturers Association www.kema.org	(703) 264-1690
LMA	Laminating Materials Association www.lma.org	(201) 664-2700
MBMA	Metal Building Manufacturer's Association www.mbma.com	(216) 241-7333
MCAA	Mechanical Contractors Association of America www.mcaa.org	(301) 869-5800
MFMA	Maple Flooring Manufacturers Association www.maplefloor.com	(847) 480-9138
MFMA	Metal Framing Manufacturers Association	(312) 644-6610

www.metalframingmfg.org

MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MIA	Masonry Institute of America www.masonryinstitute.org	(213) 388-0427
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(312) 332-0405
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084
NAPA	National Asphalt Pavement Association www.hotmix.org	(301) 731-4748
NBGQA	National Building Granite Quarries Association www.nbgqa.com	(800) 557-2848
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org	(262) 248-9094
NCRPM	National Council on Radiation Protection and Measurements www.ncrp.com	(800) 229-2652 (301) 657-2652
NCSPA	National Corrugated Steel Pipe Association www.ncspa.org	(202) 452-1700
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NEI	National Elevator Industry www.nei.org	(518) 854-3100
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NFPA	NFPA www.nfpa.org	(800) 344-3555
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318
NIA	National Insulation Association www.insulation.org	(703) 683-6422
NOFMA	National Oak Flooring Manufacturers Association www.nofma.org	(901) 526-5016
NPA	National Particleboard Association www.pbmdf.com	(301) 670-0604

NPCA	National Paint and Coatings Association www.paint.org	(202) 462-6272
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622
NSF	NSF International www.nsf.org	(800) 673-6275
NSSEA	National School Supply and Equipment Association www.nssea.org	(800) 395-5550
NTMA	National Terrazzo and Mosaic Association www.ntma.com	(800) 323-9736
NWWDA	National Wood Window and Door Association (See WDMA)	
PCA	Portland Cement Association www.portcement.org	(847) 966-6200
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting and Decorating Contractors of America www.pdca.com	(800) 332-7322
PDI	Plumbing and Drainage Institute www.pdionline.org	(800) 589-8956
PEI	Porcelain Enamel Institute www.porcelainenamel.com	(770) 281-8980
RFCI	Resilient Floor Covering Institute www.rfci.com	(301) 340-8580
RIS	Redwood Inspection Service www.calredwood.org	(888) 225-7339
RTI	Roof Tile Institute www.ntrma.org	(888) 225-7339
SDI	Steel Deck Institute www.sdi.org	(847) 462-1930
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIGMA	Sealed Insulating Glass Manufacturers Association (See IGMA)	
SJI	Steel Joist Institute	(843) 626-1995

SMA	Stucco Manufacturers Association www.stuccomfgassoc.com	(949) 640-9902
SMACNA	Sheet Metal and Airconditioning Contractors www.smacna.org	(703) 803-2980
SPFA	Spray Polyurethane Foam Alliance www.sprayfoam.org	(800) 523-6154
SPI	Society of the Plastics Industry, Inc. Spray Polyurethane Division (See SPFA)	
SPIB	Southern Pine Inspection Bureau www.spib.org	(850) 434-2611
SPRI	SPRI (Single Ply Roofing Institute) www.spri.org	(781) 647-7026
SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
TCNA	Tile Council of North America www.tileusa.com	(864) 646-8453
TPI	Truss Plate Institute www.tpinst.org	(608) 833-5900
TPI	Turfgrass Producers International www.turfgrassod.org	(800) 405-8873
UL	Underwriters Laboratories, Inc. www.ul.com	(800) 285-4476
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
WA	Wallcoverings Association www.wallcoverings.org	(312) 644-6610
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486
WCMA	Window Covering Manufacturers Association (See WCSC)	
WCSC	Window Covering Safety Council www.windowcoverings.org	(800) 506-4636
WI	Woodwork Institute www.wicnet.org	(916) 372-9943
WWCCA	Western Wall and Ceiling Contractors Association www.wwcca.org	(714) 221-5520

WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7889
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

1.7 CODE AGENCIES

- A. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

1. IAPMO - International Association of Plumbing and Mechanical Officials;
www.iapmo.org.
2. ICC - International Code Council; www.iccsafe.org.
3. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

1.8 FEDERAL GOVERNMENT AGENCIES

- A. 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. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

COE	Army Corps of Engineers www.usace.army.mil	
CPSC	Consumer Product Safety Commission www.cpse.gov	(800) 638-2772
DOC	Department of Commerce www.commerce.gov	(202) 482-2000
DOE	Department of Energy www.eren.doe.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742
USDA	Department of Agriculture www.usda.gov	(202) 720-2791
USPS	Postal Service www.usps.com	(202) 268-2000

1.9 STANDARDS AND REGULATIONS

- A. Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
 2. FED-STD - Federal Standard; (See FS).
 3. FS - Federal Specification; Available from Department of Defense Single Stock Point; <http://dodssp.daps.dla.mil>.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from General Services Administration; www.gsa.gov.
 - c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
 4. MILSPEC - Military Specification and Standards; (See DOD).
 5. USAB - United States Access Board; www.access-board.gov.
 6. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

1.10 STAGE GOVERNMENT AGENCIES

- A. 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 Appliance and 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.cal-iaq.org.
 5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
 6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
 7. TFS; Texas Forest Service; Forest Resource Development and Sustainable Forestry; <http://txforestservice.tamu.edu>.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

SECTION 01 45 23

TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1. REFERENCES

- A. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- B. ASTM E329 - Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.
- C. CBC - California Building Code.
- D. IBC - International Building Code.
- E. Title 24, Parts 1 and 2, of the California Code of Regulations. Contractor shall keep a copy of these available at the job Site for ready reference during construction
- F. DSA - Division of the State Architect, Structural Safety Section. DSA shall be notified at or before the start of construction.

1.2. OBSERVATION AND SUPERVISION

- A. The District and Construction Manager or their appointed representatives will review the Work and the Contractor shall provide facilities and access to the Work at all times as required to facilitate this review. Administration by the Architect and any consulting Structural Engineer will be in accordance with applicable regulations, including, without limitation, 24 C.C.R. §4-341.
- B. One or more Project Inspector(s) approved by DSA and employed by or in contract with the District ("Project Inspector"), will observe the Work in accordance with 24 C.C.R. §§4-333(b) and 4-342:
- C. Project Inspector shall have access to the Work wherever it is in preparation or progress for ascertaining that the Work is in accordance with the Contract Documents and all applicable code sections. Contractor shall provide facilities and access as required and shall provide assistance for sampling or measuring materials.
 - 1. Project Inspector will notify District and Architect and inform Contractor of any observed failure of Work or material to conform to Contract Documents.
 - 2. The Project Inspector shall observe and monitor all testing and inspection activities required.
- D. Contractor shall conform with all applicable laws as indicated in the Contract Documents, including, without limitation, to 24 C.C.R. §4-343. Contractor shall supervise and direct the Work and maintain a competent superintendent on the Project who is authorized to act in all matters pertaining to the Work. The Contractor shall inspect all materials, as they arrive, for compliance with the Contract Documents. Contractor shall reject defective Work or materials immediately upon delivery or failure of the Work or material to comply with the Contract Documents. The Contractor shall submit verified reports as indicated in the Contract Documents, including, without limitation, the Specifications and as required by 24 C.C.R. §4-336.

1.3. TESTS AND INSPECTIONS

- A. Contractor shall be responsible for notifying District and Project Inspector of all required tests and inspections. Contractor shall notify District and Project Inspector forty-eight (48) hours in advance of performing any Work requiring testing or inspection.
- B. Contractor shall provide access to Work to be tested and furnish incidental labor, equipment, and facilities to facilitate all inspections and tests.
- C. District will pay for first inspections and tests required by the Title 24 and other inspections or tests that District and/or Architect may direct to have made, including, but not limited to, the following principal items:
 - 1. Tests and observations for earthwork and pavings.
 - 2. Tests for concrete mix designs, including tests of trial batches.
 - 3. Tests and inspections for structural steel work.
 - 4. Field tests for framing lumber moisture content.
 - 5. Additional tests directed by District that establish that materials and installation comply with the Contract Documents.
 - 6. Test and observation of welding and expansion anchors.
 - 7. Factory observation of components and assembly of modular prefabrication structures and buildings.
- D. District may at its discretion, pay and then back charge Contractor for:
 - 1. Retests or reinspections, if required, and tests or inspection required due to Contractor error or lack of required identifications of material.
 - 2. Uncovering of work in accordance with Contract Documents.
 - 3. Testing done on weekends, holidays, and overtime will be chargeable to Contractor for the overtime portion.
 - 4. Testing done off site.
- E. Testing and inspection reports and certifications:
 - 1. If initially received by Contractor, Contractor shall provide to each of the following a copy of the agency or laboratory report of each test or inspection or certification: District; Construction Manager, if any; Architect; Consulting Engineer, if any; Other Engineers on the Project, as appropriate; and; Project Inspector.
 - 2. When the test or inspection is one required by the Title 24, a copy of the report shall also be provided to the DSA.

1.4. SELECTION AND PAYMENT

- A. District's hiring of Testing Laboratory shall in no way relieve Contractor of its obligation to perform work in accordance with requirements of Contract Documents.

1.5. CONTRACTOR RESPONSIBILITIES

- A. Submit proposed items for testing as required herein and/or as further required in the Contract Documents to Architect for review in accordance with applicable specifications.
- B. Cooperate with Laboratory personnel, and provide access to the Work and to manufacturer's facilities.
- C. Notify Architect, District, and Testing Laboratory 48 hours prior to expected time for operations requiring inspection and testing services.
- D. When tests or inspections cannot be performed after such notice, reimburse District for Laboratory personnel and travel expenses incurred due to the Contractor's negligence.

- E. Contractor shall notify District a sufficient time in advance of the manufacture of material to be supplied by Contractor pursuant to the Contract Documents, which must by terms of the Contract be tested, in order that the District may arrange for the testing of same at the source of supply.
 - 1. Any material shipped by the Contractor from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice that such testing and inspection will not be required shall not be incorporated in the Work.
- F. Contract and pay for services of District's Testing Laboratory to perform additional inspections, sampling and testing required when initial tests indicate Contractor's work and/or materials does not comply with Contract Documents.

1.6. PROJECT INSPECTOR'S ACCESS TO SITE

- A. A Project Inspector employed by the District in accordance with the requirement of State of California Code of Regulations, Title 24, Part 1 will be assigned to the Work. Project Inspector's duties are specifically defined in 24. C.C.R. §4-342, and as indicated in the General Construction Provisions.
- B. District shall at all times have access for the purpose of inspection to all parts of the Work and to the shops wherein the Work is in preparation, and Contractor shall at all times maintain proper facilities and provide safe access for such inspection.
- C. The Work in all stages of progress shall be subject to the personal continuous observation of the Inspector. Inspector shall have free access to any or all parts of the Work at any time. Contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep Inspector fully informed respecting the progress and manner of the Work and the character of the materials. Inspection of the Work shall not relieve the Contractor from any obligation set forth in the Contract Documents.
- D. The Inspector is not authorized to change, revoke, alter, enlarge or decrease in any way any requirement of the Contract Documents, drawings, specifications or subsequent change orders.
- E. Whenever there is insufficient evidence of compliance with any of the provisions of Title 24 or evidence that any material or construction does not conform to the requirements of Title 24, the Division of the State Architect may require tests as proof of compliance. Test methods shall be as specified herein or by other recognized and accepted test methods determined by the Division of the State Architect. All tests shall be performed by a testing laboratory accepted by the Division of the State Architect.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

01/11/19

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1. LOGISTICS PLAN

- A. Contractor shall provide to the District for prior approval the Contractor's mobilization and logistics plan for the Site which shall include, at a minimum, the provisions herein.

1.2. TEMPORARY UTILITIES

- A. Temporary Electric Power and Lighting:
 - 1. Power is available from Owner's existing power system for single-phase temporary lighting and power. The Owner will pay the costs of power used. Contractor will furnish and pay for power during the course of the work to the extent power is not in the building(s) or on the Site. Contractor shall be responsible for providing temporary facilities required on the Site to point of intended use.
 - 2. Contractor shall be responsible for maintaining existing lighting levels in the Project vicinity should temporary outages or service interruptions occur.
 - 3. If power greater than that available at nearby convenience outlets is required, make arrangements for such service and pay all costs of wiring and current.
- B. Temporary Heating and Ventilating:
 - 1. Heating and Ventilating is available from Owner's existing HVAC system in the building. The Owner will pay the costs of HVAC power used.
 - 2. If adequate forced ventilation greater than that available from existing HVAC system is required, provide and pay for costs of adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors or gases.
 - 3. Contractor shall pay the costs of installation, maintenance, operation, and removal of temporary heat and ventilation, including costs for fuel consumed, required for the performance of the Work.
- C. Temporary Water:
 - 1. Available from existing building. The Contractor shall be responsible for undue wasting of water used on the Work. Furnish hoses and temporary piping placed where water connections are available.
 - 2. Contractor shall make potable water available for human consumption.
- D. Temporary Sanitary Facilities:
 - 1. Contractor shall provide sanitary temporary facilities in no fewer numbers than required by law and such additional facilities as may be directed by the Inspector for the use of all workers. The facilities shall be maintained in a sanitary condition at all times and shall be left at the Site until removal is directed by the Project Inspector or Contractor completes all Work.
 - 2. Use of permanent toilet facilities on the school campus shall not be permitted except by consent of the Project Inspector and District.
- E. Temporary Telephone and Internet Service: Not required.
- F. Fire Protection:
 - 1. Contractor shall provide and maintain fire extinguishers and other equipment for fire protection. Such equipment shall be designated for use for fire protection only and shall comply with all requirements of the California Fire,

- State Fire Marshall and/or its designee.
2. Where on-site welding and burning of steel is unavoidable, Contractor shall provide protection for adjacent surfaces.

G. Trash Removal:

1. Contractor shall provide trash removal on a timely basis, not less than weekly from all Site Offices and the Site.

H. Temporary Job Office Facilities: Not required.

1.3. CONSTRUCTION AIDS

A. Plant and Equipment:

1. Contractor shall furnish, operate, and maintain a complete plant for fabricating, handling, conveying, installing, and erecting materials and equipment. Include equipment, tools, and appliances necessary for performance of the Work.
2. Contractor shall maintain plant and equipment in safe and efficient operating condition. Damages due to defective plant and equipment, and uses made thereof, shall be repaired by Contractor at no expense to the District.

B. No District tools or equipment shall be used by Contractor for the performance of the Work.

1.4. BARRIERS AND ENCLOSURES

A. Contractor shall obtain District's written permission for locations and types of temporary barriers and enclosures, including fire-rated materials proposed for use, prior to their installation.

B. Contractor shall provide a six (6) foot high, chain link perimeter fence with post driven into the ground and fabric screen as a temporary barrier around construction area. Contractor shall provide and maintain temporary enclosures to prevent public entry and to protect persons using other buildings and portions of the Site and/or Premises. Contractor shall remove temporary fence, barriers and enclosure upon Completion of the Work.

C. Contractor shall provide site access to existing facilities for persons using other buildings and portions of the Site, the public, and for deliveries and other services and activities.

1.5. SECURITY

A. Contractor shall secure all construction equipment, machinery and vehicles, park and store only within fenced area, and render inoperable during non-work hours. Contractor is responsible for ensuring that no construction materials, tools, equipment, machinery or vehicles can be used for unauthorized entry or other damage or interference to activities and security of existing facilities adjacent to and in the vicinity of the Project Site.

1.6. TEMPORARY CONTROLS

A. Noise Control:

1. Contractor acknowledges that adjacent facilities may remain in operation during all or a portion of the Work, and it shall take all reasonable precautions to minimize noise as required by applicable laws and the Contract Documents.
2. Notice of proposed noisy operations, including without limitation, operation of

pneumatic demolition tools, concrete saws, and other equipment, shall be submitted to District a minimum of forty-eight (48) hours in advance of their performance.

- B. Noise and Vibration:
 - 1. Equipment and impact tools shall have intake and exhaust mufflers.
 - 2. Contractor shall cooperate with District to minimize and/or cease the use of noisy and vibratory equipment if that equipment becomes objectionable by its longevity.
- C. Dust and Dirt:
 - 1. Contractor shall conduct demolition and construction operations to minimize the generation of dust and dirt, and prevent dust and dirt from interfering with the progress of the Work and from accumulating in the Work and adjacent areas including, without limitation, occupied facilities.
 - 2. Contractor shall periodically water exterior demolition and construction areas to minimize the generation of dust and dirt.
 - 3. Contractor shall ensure that all hauling equipment and trucks carrying loads of soil and debris shall have their loads sprayed with water or covered with tarpaulins, and as otherwise required by local and state ordinance.
 - 4. Contractor shall prevent dust and dirt from accumulating on walks, roadways, parking areas, and planting, and from washing into sewer and storm drain lines.
- D. Water: Contractor shall not permit surface and subsurface water, and other liquids, to accumulate in or about the vicinity of the Premises. Should accumulation develop, Contractor shall control the water or other liquid, and suitably dispose of it by means of temporary pumps, piping, drainage lines, troughs, ditches, dams, or other methods.
- E. Pollution:
 - 1. No burning of refuse, debris, or other materials shall be permitted on or in the vicinity of the Premises.
 - 2. Contractor shall comply with applicable regulatory requirements and anti-pollution ordinances during the conduct of the Work including, without limitation, demolition, construction, and disposal operations.
- F. Lighting: If portable lights are used after dark, all light must be located so as not to direct light into neighboring property.

1.7. PUBLICITY RELEASES

- A. Contractor shall not release any information, story, photograph, plan, or drawing relating information about the Project to anyone, including press and other public communications medium, including, without limitation, on website(s). Contractor shall not bring anyone onto the project site during or after construction for the purpose of publicity or marketing without prior written permission of the District.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

01/11/19

SECTION 01 60 00

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1. MATERIAL AND EQUIPMENT

- A. Only items approved by the District and/or Architect shall be used.
- B. Contractor shall submit lists of Products and other Product information in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.

1.2. MATERIAL AND EQUIPMENT COLORS

- A. The Contractor shall comply with all schedule(s) of colors provided by the District and/or Architect.
- B. No individual color selections will be made until after approval of all pertinent materials and equipment and after receipt of appropriate samples in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.
- C. Contractor shall request priority in writing for any item requiring advance ordering to maintain the approved Construction Schedule.

1.3. DELIVERY, STORAGE, AND HANDLING

- A. Contractor shall deliver manufactured materials in original packages, containers, or bundles (with seals unbroken), bearing name or identification mark of manufacturer.
- B. Contractor shall deliver fabrications in as large assemblies as practicable; where specified as shop-primed or shop-finished, package or crate as required to preserve such priming or finish intact and free from abrasion.
- C. Contractor shall store materials in such a manner as necessary to properly protect them from damage. Materials or equipment damaged by handling, weather, dirt, or from any other cause will not be accepted.
- D. Except for items that the District has approved, in writing, for Contractor to store off-site, all materials are not be acceptable that have been warehoused for long periods of time, stored or transported in improper environment, improperly packaged, inadequately labeled, poorly protected, excessively shipped, deviated from normal distribution pattern, or reassembled.
- E. Contractor shall store material so as to cause no obstructions of sidewalks, roadways, and underground services. Contractor shall protect material and equipment furnished pursuant to the Contract Documents.
- F. Contractor may store materials on Site with prior written approval by the District, all material shall remain under Contractor's control and Contractor shall remain liable for any damage to the materials. Should the Project Site not have storage area available, the Contractor shall provide for off-site storage at no cost to District.
- G. When any room in Project is used as a shop or storeroom, the Contractor shall be responsible for any repairs, patching, or cleaning necessary due to that use. Location of storage space shall be subject to prior written approval by District.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers listed in various sections of Contract Documents are names of those manufacturers that are believed to be capable of supplying one or more of items specified therein.
- B. The listing of a manufacturer does not imply that every product of that manufacturer is acceptable as meeting the requirements of the Contract Documents.

2.2 FACILITIES AND EQUIPMENT

- A. Contractor shall provide, install, maintain, and operate a complete and adequate facility for handling, the execution, disposal, and distribution of material and equipment as required for proper and timely performance of Work.

2.3 MATERIAL REFERENCE STANDARDS

- A. Where material is specified solely by reference to "standard specifications" and if requested by District, Contractor shall submit for review data on actual material proposed to be incorporated into Work, listing name and address of vendor, manufacturer, or producer, and trade or brand names of those materials, and data substantiating compliance with standard specifications.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Where not more specifically described in any other Contract Documents, workmanship shall conform to methods and operations of best standards and accepted practices of trade or trades involved and shall include items of fabrication, construction, or installation regularly furnished or required for completion (including finish and for successful operation, as intended).
- B. Work shall be executed by tradespersons skilled in their respective field of work. When completed, parts shall have been durably and substantially built and present a neat appearance.

3.2 COORDINATION

- A. Contractor shall coordinate installation of materials and equipment so as to not interfere with installation of other work. Adjustment or rework because of Contractor's failure to coordinate will be at no additional cost to District.
- B. Contractor shall examine in-place materials and equipment for readiness, completeness, fitness to be concealed or to receive Work, and compliance with Contract Documents. Concealing or covering work constitutes acceptance of additional cost which will result should in-place materials and equipment be found unsuitable for receiving other work or otherwise deviating from the requirements of the Contract Documents.

3.3 COMPLETENESS

- A. Contractor shall provide all portions of the Work, unless clearly stated otherwise, installed complete and operational with all elements, accessories, anchorages, utility connections, etc., in manner to assure well-balanced performance, in accordance with manufacturer's recommendations and in accordance with Contract Documents.

For example, electric water coolers require water, electricity, and drain services; roof drains require drain system; sinks fit within countertop, etc. Terms such as “installed complete,” “operable condition,” “for use intended,” “connected to all utilities,” “terminate with proper cap,” “adequately anchored,” “patch and refinish,” “to match similar,” should be assumed to apply in all cases, except where completeness of functional or operable condition is specifically stated as not required.

3.4 APPROVED INSTALLER OR APPLICATOR

- A. Contractor shall ensure that all installations are only performed by a manufacturer’s approved installer or applicator.

3.5 MANUFACTURER'S RECOMMENDATIONS

- A. All installations shall be in accordance with manufacturer’s published recommendations and specific written directions of manufacturer's representative. Should Contract Documents differ from recommendations of manufacturer or directions of manufacturer’s representative, Contractor shall analyze differences, make recommendations to the District and the Architect in writing, and shall not proceed until interpretation or clarification has been issued by the District and/or the Architect.

END OF SECTION

01/11/19

SECTION 01 66 00

DELIVERY, STORAGE AND HANDLING

PART 1 - GENERAL

1.1. PRODUCTS

- A. Products are as defined in the General Construction Provisions.
- B. Contractor shall not use and/or reuse materials and/or equipment removed from existing Premises, except as specifically permitted by the Contract Documents.
- C. Contractor shall provide interchangeable components of the same manufacturer, for similar components.

1.2. TRANSPORTATION AND HANDLING

- A. Contractor shall transport and handle Products in accordance with manufacturer's instructions.
- B. Contractor shall promptly inspect shipments to confirm that Products comply with Contract requirements, are of correct quantity, and are undamaged.
- C. Contractor shall provide equipment and personnel to properly handle Products to prevent soiling, disfigurement, or damage.

1.3. STORAGE AND PROTECTION

- A. Contractor shall store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Contractor shall store sensitive Products in weather-tight, climate controlled enclosures.
- B. Contractor shall place fabricated Products that are stored outside, on above-ground sloped supports.
- C. Contractor shall provide off-site storage and protection for Products when Site does not permit on-site storage or protection.
- D. Contractor shall cover Products subject to deterioration with impervious sheet covering and provide ventilation to avoid condensation.
- E. Contractor shall store loose granular materials on solid flat surfaces in a well-drained area and prevent mixing with foreign matter.
- F. Contractor shall provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- G. Contractor shall arrange storage of Products to permit access for inspection and periodically inspect to assure Products are undamaged and are maintained under specified conditions.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

01/11/19

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 - GENERAL

1.1. CUTTING AND PATCHING

- A. Contractor shall be responsible for all cutting, fitting, and patching, including associated excavation and backfill, required to complete the Work or to:
 - 1. Make several parts fit together properly.
 - 2. Uncover portions of Work to provide for installation of ill-timed Work.
 - 3. Remove and replace defective Work.
 - 4. Remove and replace Work not conforming to requirements of Contract Documents.
 - 5. Remove Samples of installed Work as specified for testing.
 - 6. Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.
 - 7. Attaching new materials to existing remodeling areas – including painting (or other finishes) to match existing conditions.
- B. In addition to Contract requirements, upon written instructions from District, Contractor shall uncover Work to provide for observations of covered Work in accordance with the Contract Documents; remove samples of installed materials for testing as directed by District; and remove Work to provide for alteration of existing Work.
- C. Contractor shall not cut or alter Work, or any part of it, in such a way that endangers or compromises the integrity of the Work, the Project, or work of others.
- D. Contractor shall not cut and patch operating elements and safety 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. Operating elements include the following:
 - 1. Primary operational systems and equipment.
 - 2. Air or smoke barriers.
 - 3. Fire-suppression systems.
 - 4. Mechanical systems piping and ducts.
 - 5. Control systems.
 - 6. Communication systems.
 - 7. Conveying systems.
 - 8. Electrical wiring systems.
- E. Contractor shall not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing capacity to perform as intended, or that results in increased maintenance or decreased operational life of safety. Miscellaneous elements include the following:
 - 1. Water, moisture or vapor barriers.
 - 2. Membranes and flashings.
 - 3. Exterior curtain-wall construction.
 - 4. Equipment supports.
 - 5. Piping, ductwork, vessels and equipment.
 - 6. Noise and vibration control elements and systems.
 - 7. Shoring, bracing and sheeting.

1.2 SUBMITTALS

- A. Contractor shall submit written notice to District pursuant to the applicable notice provisions of the Contract Documents, requesting consent to proceed with the cutting or alteration (Request) at least ten (10) days prior to any cutting or alterations that may affect the structural safety of Project, or work of others, including the following:
 - 1. The work of the District or other trades.
 - 2. Structural value or integrity of any element of Project.
 - 3. Integrity or effectiveness of weather-exposed or weather-resistant elements or systems.
 - 4. Efficiency, operational life, maintenance or safety of operational elements.
 - 5. Visual qualities of sight-exposed elements.
- B. Contractor's Request shall also include:
 - 1. Identification of Project.
 - 2. Description of affected Work.
 - 3. Necessity for cutting, alteration, or excavations.
 - 4. Effects of Work on District, other trades, or structural or weatherproof integrity of Project.
 - 5. Description of proposed Work:
 - a. Scope of cutting, patching, alteration, or excavation.
 - b. Trades that will execute Work.
 - c. Products proposed to be used.
 - d. Extent of refinishing to be done.
 - 6. Alternates to cutting and patching.
 - 7. Cost proposal, when applicable.
 - 8. The scheduled date the Contractor intends to perform the Work and the duration of time to complete the Work.
 - 9. Written permission of other trades whose Work will be affected.

1.3 QUALITY ASSURANCE

- A. Contractor shall ensure that cutting, fitting, and patching shall achieve security, strength, weather protection, appearance for aesthetic match, efficiency, operational life, maintenance, safety of operational elements, and the continuity of existing fire ratings.
- B. Contractor shall ensure that cutting, fitting, and patching shall successfully duplicate undisturbed adjacent profiles, materials, textures, finishes, colors, and that materials shall match existing construction. Where there is dispute as to whether duplication is successful or has been achieved to a reasonable degree, the District's decision shall be final.

1.4 PAYMENT FOR COSTS

- A. Cost caused by ill-timed or defective Work or Work not conforming to Contract Documents, including costs for additional services of the District, its consultants, including but not limited to the Architect, the Project Inspector(s), Engineers, and Agents, will be paid by Contractor and/or deducted from the Contract by the District.
- B. District shall only pay for cost of Work if it is part of the original Contract Price or if a change has been made to the contract in compliance with the provisions of the General Construction Provisions. Cost of Work performed upon instructions from the District, other than defective or nonconforming Work, will be paid by District on approval of written Change Order. Contractor shall provide written cost proposals prior to proceeding with cutting and patching.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Contractor shall provide for replacement and restoration of Work removed. Contractor shall comply with the Contract Documents and with the Industry Standard(s), for the type of Work, and the Specification requirements for each specific product involved. If not specified, Contractor shall first recommend a product of a manufacturer or appropriate trade association for approval by the District.
- B. Materials to be cut and patched include those damaged by the performance of the Work.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Contractor shall inspect existing conditions of the Site and the Work, including elements subject to movement or damage during cutting and patching, excavating and backfilling. After uncovering Work, Contractor shall inspect conditions affecting installation of new products.
- B. Contractor shall report unsatisfactory or questionable conditions in writing to District as indicated in the General Construction Provisions and shall proceed with Work as indicated in the General Construction Provisions by District.

3.2 PREPARATION

- A. Contractor shall provide shoring, bracing and supports as required to maintain structural integrity for all portions of the Project, including all requirements of the Project.
- B. Contractor shall provide devices and methods to protect other portions of Project from damage.
- C. Contractor shall, provide all necessary protection from weather and extremes of temperature and humidity for the Project, including without limitation, any work that may be exposed by cutting and patching Work. Contractor shall keep excavations free from water.

3.3 ERECTION, INSTALLATION AND APPLICATION

- A. With respect to performance, Contractor shall:
 - 1. Execute fitting and adjustment of products to provide finished installation to comply with and match specified tolerances and finishes.
 - 2. Execute cutting and demolition by methods that will prevent damage to other Work, and provide proper surfaces to receive installation of repairs and new Work.
 - 3. Execute cutting, demolition excavating, and backfilling by methods that will prevent damage to other Work and damage from settlement.
 - 4. Contractor shall employ original installer or fabricator to perform cutting and patching for:
 - 5. Weather-exposed surfaces and moisture-resistant elements such as roofing, sheet metal, sealants, waterproofing, and other trades.
 - 6. Sight-exposed finished surfaces.
- B. Contractor shall execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes as shown or specified in the Contract Documents including, without limitation, the Drawings and Specifications.
- C. Contractor shall fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces. Contractor shall conform to all Code requirements for

penetrations or the Drawings and Specifications, whichever calls for a higher quality or more thorough requirement. Contractor shall maintain integrity of both rated and non-rated fire walls, ceilings, floors, etc.

- D. Contractor shall restore Work which has been cut or removed. Contractor shall install new products to provide completed Work in accordance with requirements of the Contract Documents and as required to match surrounding areas and surfaces.
- E. Contractor shall refinish all continuous surfaces to nearest intersection as necessary to match the existing finish to any new finish.

END OF SECTION

01/11/19

SECTION 01 77 00

CONTRACT CLOSEOUT AND FINAL CLEANING

PART 1 - GENERAL

1.1. CLOSEOUT PROCEDURES

- A. Contractor shall comply with all closeout provisions as indicated in the General Construction Provisions.

1.2. FINAL CLEANING

- A. Contractor shall execute final cleaning prior to final inspection.
- B. Contractor shall clean interior and exterior glass and surfaces exposed to view; remove temporary labels, tape, stains, and foreign substances, polish transparent and glossy surfaces, wax and polish new vinyl floor surfaces, vacuum carpeted and soft surfaces.
- C. Contractor shall clean equipment and fixtures to a sanitary condition.
- D. Contractor shall replace filters of operating equipment.
- E. Contractor shall clean debris from roofs, gutters, down spouts, and drainage systems.
- F. Contractor shall clean Site, sweep paved areas, and rake clean landscaped surfaces.
- G. Contractor shall remove waste and surplus materials, rubbish, and construction facilities from the Site.

1.3. ADJUSTING

- A. Contractor shall adjust operating products and equipment to ensure smooth and unhindered operation.

1.4. RECORD DOCUMENTS AND SHOP DRAWINGS

- A. Contractor shall legibly mark each item to record actual construction, including:
 - 1. Measured depths of foundation in relation to finish floor datum.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permit surface improvements.
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 4. Field changes of dimension and detail.
 - 5. Details not on original Contract Drawings
 - 6. Changes made by modification(s).
 - 7. References to related Shop Drawings and modifications.
 - 8. Contractor will provide one set of Record Drawings to District in an electronic format and one set on paper.

9. Contractor shall submit all required documents to District and/or Architect prior to or with its final Application for Payment.

1.5. INSTRUCTION OF DISTRICT PERSONNEL

- A. Before final inspection, at agreed upon times, Contractor shall instruct District's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. For equipment requiring seasonal operation, Contractor shall perform instructions for other seasons within six (6) months.
- C. Contractor shall use operation and maintenance manuals as basis for instruction. Contractor shall review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- D. Contractor shall prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.
- E. Contractor shall use operation and maintenance manuals as basis for instruction. Contractor shall review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- F. Contractor shall be available for up to two (2) four-hour sessions of additional training of District personnel at any time within the first year of operation of the Site.

1.6. SPARE PARTS AND MAINTENANCE MATERIALS

- A. Contractor shall provide products, spare parts, maintenance, and extra materials in quantities specified in the Specifications and in Manufacturer's recommendations.
- B. Contractor shall provide District all required Operation and Maintenance Data.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

01/11/19

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1. QUALITY ASSURANCE

- A. Contractor shall prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.2. FORMAT

- A. Contractor shall prepare data in the form of an instructional manual entitled "OPERATIONS AND MAINTENANCE MANUAL & INSTRUCTIONS" ("Manual").
- B. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size. When multiple binders are used, Contractor shall correlate data into related consistent groupings.
- C. Cover: Contractor shall identify each binder with typed or printed title "OPERATION AND MAINTENANCE MANUAL & INSTRUCTIONS"; and shall list title of Project and identify subject matter of contents.
- D. Contractor shall arrange content by systems process flow under section numbers and sequence of Table of Contents of the Contract Documents.
- E. Contractor shall provide tabbed fly leaf for each separate Product and system, with typed description of Product and major component parts of equipment.
- F. Text: The content shall include Manufacturer's printed data, or typewritten data on 24 pound paper.
- G. Drawings: Contractor shall provide with reinforced punched binder tab and shall bind in with text; folding larger drawings to size of text pages.

1.3. CONTENTS, EACH VOLUME

- A. Table of Contents: Contractor shall provide title of Project; names, addresses, and telephone numbers of the Architect, any engineers, subconsultants, Subcontractor(s), and Contractor with name of responsible parties; and schedule of Products and systems, indexed to content of the volume.
- B. For Each Product or System: Contractor shall list names, addresses, and telephone numbers of Subcontractor(s) and suppliers, including local source of supplies and replacement parts.
- C. Product Data: Contractor shall mark each sheet to clearly identify specific Products and component parts, and data applicable to installation. Delete inapplicable information.
- D. Drawings: Contractor shall supplement Product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Contractor shall not use Project Record Documents as maintenance drawings.
- E. Text: The Contractor shall include any and all information as required to supplement Product data. Contractor shall provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

1.4. MANUAL FOR MATERIALS AND FINISHES

- A. Building Products, Applied Materials, and Finishes: Contractor shall include Product data, with catalog number, size, composition, and color and texture designations. Contractor shall provide information for re-ordering custom manufactured Products.
- B. Instructions for Care and Maintenance: Contractor shall include Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture Protection and Weather Exposed Products: Contractor shall include Product data listing applicable reference standards, chemical composition, and details of installation. Contractor shall provide recommendations for inspections, maintenance, and repair.
- D. Additional Requirements: Contractor shall include all additional requirements as specified in the Specifications.
- E. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.5. MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Each Item of Equipment and Each System: Contractor shall include description of unit or system, and component parts and identify function, normal operating characteristics, and limiting conditions. Contractor shall include performance curves, with engineering data and tests, and complete nomenclature, and commercial number of replaceable parts.
- B. Panelboard Circuit Directories: Contractor shall provide electrical service characteristics, controls, and communications.
- C. Contractor shall include color coded wiring diagrams as installed.
- D. Operating Procedures: Contractor shall include start-up, break-in, and routine normal operating instructions and sequences. Contractor shall include regulation, control, stopping, shut-down, and emergency instructions. Contractor shall include summer, winter, and any special operating instructions.
- E. Maintenance Requirements: Contractor shall include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- F. Contractor shall provide servicing and lubrication schedule, and list of lubricants required.
- G. Contractor shall include manufacturer's printed operation and maintenance instructions.
- H. Contractor shall include sequence of operation by controls manufacturer.
- I. Contractor shall provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- J. Contractor shall provide control diagrams by controls manufacturer as installed.
- K. Contractor shall provide Contractor's coordination drawings, with color coded piping diagrams as installed.

- L. Contractor shall provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- M. Contractor shall provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- N. Additional Requirements: Contractor shall include all additional requirements as specified in Specification(s).
- O. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.6. SUBMITTAL

- A. Concurrent with the Submittal Schedule as indicated in the General Construction Provisions (Exhibit D to the Facilities Lease), Contractor shall submit to the District for review two (2) copies of a preliminary draft of proposed formats and outlines of the contents of the Manual.
- B. For equipment, or component parts of equipment put into service during construction and to be operated by District, Contractor shall submit draft content for that portion of the Manual within ten (10) days after acceptance of that equipment or component.
- C. On or before the Contractor submits its final application for payment, Contractor shall submit two (2) copies of a complete Manual in final form. The District will provide comments to Contractor and Contractor must revise the content of the Manual as required by District prior to District's approval of Contractor's final Application for Payment.
- D. Contractor must submit two (2) copies of revised Manual in final form within ten (10) days after receiving District's comments. Failure to do so will be a basis for the District withholding funds sufficient to protect itself for Contractor's failure to provide a final Manual to the District. All final documents to be concurrently provided to the District in an electronic format.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

01/11/19

SECTION 01 78 36

WARRANTIES

PART 1 - GENERAL

1.1. FORMAT

- A. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size.
- B. Cover: Contractor shall identify each binder with typed or printed title "WARRANTIES" and shall list title of Project.
- C. Table of Contents: Contractor shall provide title of Project; name, address, and telephone number of Contractor and equipment supplier, and name of responsible principal. Contractor shall identify each item with the number and title of the specific Specification, document, provision, or section in which the name of the Product or work item is specified.
- D. Contractor shall separate each warranty with index tab sheets keyed to the Table of Contents listing, providing full information and using separate typed sheets as necessary. Contractor shall list each applicable and/or responsible Subcontractor(s), supplier(s), and/or manufacturer(s), with name, address, and telephone number of each responsible principal(s).

1.2. PREPARATION

- A. Contractor shall obtain warranties, executed in duplicate by each applicable and/or responsible subcontractor(s), supplier(s), and manufacturer(s), within ten (10) days after completion of the applicable item or work. Except for items put into use with District's permission, Contractor shall leave date of beginning of time of warranty until the date of completion is determined.
- B. Contractor shall verify that warranties are in proper form, contain full information, and are notarized, when required.
- C. Contractor shall co-execute submittals when required.
- D. Contractor shall retain warranties until time specified for submittal.

1.3. TIME OF SUBMITTALS

- A. For equipment or component parts of equipment put into service during construction with District's permission, Contractor shall submit a draft warranty for that equipment or component within ten (10) days after acceptance of that equipment or component.
- B. On or before the Contractor submits its final application for payment, Contractor shall submit all warranties and related documents in final form. The District will provide comments to Contractor and Contractor must revise the content of the warranties as required by District prior to District's approval of Contractor's final Application for Payment.
- C. For items of Work that are not completed until after the date of Completion, Contractor shall provide an updated warranty for those item(s) of Work within ten (10) days after acceptance, listing the date of acceptance as start of warranty period.

PART 2 – PRODUCTS (Not Used)

SECTION 01 78 39

RECORD DOCUMENTS

PART 1 – GENERAL (Not Used)

PART 2 – PRODUCTS

2.1 RECORD DRAWINGS - GENERAL

- A. "Record Drawings" may also be referred to in the Contract as "As-Built Drawings."
- B. As indicated in the Contract Documents, District will provide Contractor with one set of reproducible plans of the original Contract Drawings.
- C. Contractor shall maintain at each Project Site one (1) set of marked-up plans and shall transfer all changes and information to those marked-up plans, as often as required in the Contract Documents, but in no case less than once each month. Contractor shall submit to the Project Inspector one set of the Project Record Drawings ("As-Built") showing all changes incorporated into the Work since the preceding monthly submittal. The As-Built shall be available at the Project Site. The Contractor shall submit reproducible documents at the conclusion of the Project following review of the red-lined prints.
- D. Label and date each Record Drawing "RECORD DOCUMENT" in legibly printed letters.
- E. All deviations in construction, including but not limited to pipe and conduit locations and deviations caused by without limitation Change Orders, Construction Directives, RFI's, and Addenda, shall be accurately and legibly recorded by Contractor
- F. Locations and changes shall be done by Contractor in a neat and legible manner and, where applicable, indicated by drawing a "cloud" around the changed or additional information.

2.2 RECORD DRAWING INFORMATION

- A. Contractor shall record the following information:
 - 1. Locations of Work buried under or outside each building, including, without limitation, all utilities, plumbing and electrical lines, and conduits.
 - 2. Actual numbering of each electrical circuit.
 - 3. Locations of significant Work concealed inside each building whose general locations are changed from those shown on the Contract Drawings.
 - 4. Locations of all items, not necessarily concealed, which vary from the Contract Documents.
 - 5. Installed location of all cathodic protection anodes.
 - 6. Deviations from the sizes, locations, and other features of installations shown in the Contract Documents.
 - 7. Locations of underground work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stubouts, invert elevations, etc.
 - 8. Sufficient information to locate Work concealed in each building with reasonable ease and accuracy.
- B. In some instances, this information may be recorded by dimension. In other instances, it may be recorded in relation to the spaces in the building near which it was installed.

- C. Contractor shall provide additional drawings as necessary for clarification.
- D. Contractor shall provide reproducible record drawings, made from final Shop Drawings marked "No Exceptions Taken" or "Approved as Noted."

2.3 RECORD SPECIFICATIONS

- A. Contractor shall mark each section legibly to record manufacturer, trade name, catalog number, and supplier of each Product and item of equipment actually installed.

PART 3 – EXECUTION

3.1 MAINTENANCE OF RECORD DOCUMENTS

- A. Contractor shall store Record Documents apart from documents used for construction as follows:
 - 1. Provide files and racks for storage of Record Documents.
 - 2. Maintain Record Documents in a clean, dry, legible condition and in good order.
- 3. Contractor shall not use Record Documents for construction purposes.

END OF SECTION

01/11/19

SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Salvage of existing items to be reused, recycled, or reinstalled.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Requirements:

1. Section 01 11 00 "Summary of Work" for restrictions on the use of the premises, and Owner-occupancy requirements.
2. Section 01 73 29 "Cutting and Patching" for cutting and patching procedures.
3. Section 01 35 16 "Alteration Project Procedures" for general protection and work procedures for alteration projects.

1.2 DEFINITIONS

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

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 MATERIALS OWNERSHIP

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

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. Schedule of Selective Demolition Activities: Indicate the following:
 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
- C. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.
- D. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Submit before Work begins.
- E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.6 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.
- B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.7 QUALITY ASSURANCE

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

1.8 FIELD CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- C. 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.

- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

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/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Perform 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. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- E. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or preconstruction video.

3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from designated 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.
 - 1. Comply with requirements for existing services/systems interruptions specified in Section 01 11 00 "Summary of Work."
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated 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. 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.
 - 3. Disconnect, demolish, and remove plumbing, HVAC systems, equipment, and components indicated 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.
 - 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 50 00 "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, to minimize disturbance of adjacent surfaces. 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 fire watch and portable fire-suppression devices during flame-cutting operations.
 - 5. Maintain fire watch during and for at least 1 hour 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. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 9. Dispose of demolished items and materials promptly.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Section 01 50 00 "Temporary Facilities and Controls."
- C. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.
- B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- C. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Existing Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Remove demolished materials from Project site and recycle or dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
 1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- 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.

3.9 SELECTIVE DEMOLITION SCHEDULE

- A. Existing Items to Be Removed:
 1. Designated (e) door, door frame, and all related accessories.
 2. Designated (e) gate.
 3. Designated (e) door; (e) frame to remain.
 4. Designated (e) mechanical units.
 5. Designated (e) 34" height counter.
 6. Designated (e) suspended ceiling and all related accessories.
 7. Designated (e) gypsum board ceilings.
 8. Designated (e) gypsum board wall finish.
 9. Designated (e) adhesive applied acoustical ceiling tile.
 10. Designated (e) finish flooring materials.
 11. Designated (e) soffits.

12. Designated (e) cement plaster ceiling and framing.
13. Designated portion of (e) wall for placement of new door.
14. Designated (e) lighting fixtures.
15. Designated (e) mechanical supply and return grilles and branch ducting.
16. Designated (e) electrical power packs, occupancy sensors, and switches.
17. Designated (e) smoke and heat detectors.
18. Designated (e) furnace, cooling coil, return plenum below unit, and all mounts and accessories.
19. Designated (e) PVC combustion air and flue piping to 12" below roof. Above roof, demolish (e) weatherproof tops.
20. Designated (e) duct joints below fire damper access panel at (e) supply duct riser.
21. Designated (e) branch outside air ductwork back to connection to main.
22. Designated (e) return riser ductwork.
23. Designated (e) thermostats and all associated wiring.
24. Designated (e) condensate piping serving condensing furnaces and cooling coils.
25. Designated (e) gas piping serving condensing furnaces.

B. Existing Items to Be Removed and Salvaged to Owner:

1. Designated (e) condensing units.

C. Existing Items to be Removed and Reinstalled:

1. Designated (e) roller window shades.
2. Designated (e) fire alarm device (horn/strobe).
3. Designated (e) heat detectors and smoke detectors.

D. Existing Items to Remain:

1. Designated (e) vault.
2. Designated (e) range and microwave.
3. Designated (e) refrigerator.
4. Designated (e) bookcase.
5. Designated (e) fire extinguisher.
6. Designated (e) plumbing fixtures.
7. Designated (e) toilet partitions.
8. Designated (e) grab bars.
9. Designated (e) toilet paper dispensers.
10. Designated (e) mirrors.
11. Designated (e) trash receptacles.
12. Designated (e) soap dispensers.
13. Designated (e) 34" height counter.
14. Designated (e) 34" height work table.
16. Designated (e) floor finishes.
17. Designated (e) signage.
18. Designated (e) electrical wiring at junction boxes for reconnection in the new work.
19. Designated (e) accessible parking signs.
20. Designated (e) concrete wheelstops.
21. Designated (e) truncated domes tactile paving.
22. Designated (e) staff and visitor accessible parking.
23. Designated (e) student drop-off zone and signage.
24. Designated (e) concrete curbs.
25. Designated (e) concrete sidewalks.
26. Designated (e) asphalt concrete paving.
27. Designated (e) concrete curb ramps.
28. Designated (e) flush curbs.
29. Designated (e) flush curbs.
30. Designated (e) fire alarm devices.
31. Designated (e) FACP.

- 32. Designated (e) annunciator.
- 33. Designated (e) conduit with FA wires.
- 34. Designated (e) condensing unit.
- 35. Designated (e) supply duct risers high in room with fire damper access panel.
- 36. Designated (e) ductwork run through trusses.
- 37. Designated (e) return grille to be used for room pressurization relief.
- 39. Designated (e) relief duct opening into attic.
- 40. Designated (e) supply duct elbow and riser.
- 41. Designated (e) OSA louver.
- 42. Designated (e) supply air ductwork.
- 43. Designated (e) return air ductwork.

END OF SECTION

03/29/19

SECTION 03 30 53

MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes miscellaneous cast-in-place concrete for concrete housekeeping pads, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 00 for information concerning availability and use of references.

American Concrete Institute (ACI)
American Society for Testing and Materials (ASTM)

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture.
- C. Mill Affidavits: Submit mill affidavits stating the grades and physical and chemical properties of the reinforcing steel, and conformance with ASTM specifications.

1.4 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

PART 2 - PRODUCTS

2.1 FORMWORK MATERIALS

- A. Forms:
 - 1. Lumber: Douglas fir, S4S, meeting the requirements of WCLIB "Standard No. 17", or WWPA "Western Lumber Grading Rules 05".

2. Plywood: APA B-B Plyform Class I Exterior plywood, meeting the requirements of U.S. Product Standard PS 1-09, 5/8-inch minimum thickness. May be used for forms instead of boards.
3. Form Ties and Spreaders: Standard metal form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch of concrete face.

2.2 CONCRETE, GENERAL

- A. Comply with the following sections of ACI 301 unless modified by requirements in the Contract Documents:
 1. "General Requirements."
 2. "Formwork and Formwork Accessories."
 3. "Reinforcement and Reinforcement Supports."
 4. "Concrete Mixtures."
 5. "Handling, Placing, and Constructing."
- B. Comply with ACI 117.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- B. Plain-Steel Tie Wire: ASTM A1064/A1064M, as drawn.
- C. Accessories: Provide reinforcement accessories consisting of spacers, chairs, ties, and similar items as required for spacing, assembling, and supporting reinforcement in place.

2.4 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
 1. Portland Cement: ASTM C150/C150M, Type II.
 2. Fly Ash: ASTM C618, Class F. Limit use of pozzolan to not more than 15 percent of cement content by weight.
- C. Normal-Weight Aggregate: ASTM C33/C33M, 1-inch nominal maximum aggregate size.
 1. Fine Aggregate: Washed clean, uniformly screen graded, and contain not more than 2 percent by weight of deleterious materials such as shale, schist, alkali, clay lumps, earth, loam, mica or similar materials. Uniformly grade fine aggregate from fine to coarse.
 2. Coarse Aggregate: Clean, hard, crushed rock or washed gravel, free from organic materials or soft or friable materials, contain not more than 2 percent by weight of shale or cherty material and not more than 15 percent by weight of elongated fragments. Maximum size aggregate shall be 1 inch.

- D. Air-Entraining Admixture: ASTM C260/C260M.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 - 2. Retarding Admixture: ASTM C494/C494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
- F. Water: ASTM C94/C94M.

2.5 RELATED MATERIALS

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

2.6 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.
- C. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B.

2.7 CONCRETE MIXTURES

- A. Comply with ACI 301.
- B. Normal-Weight Concrete:
 - 1. Minimum Compressive Strength: 3000 psi at 28 days.
 - 2. Maximum W/C Ratio: 0.50.
 - 3. Cementitious Materials: Use fly ash, pozzolan, as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 15 percent.
 - 4. Slump Limit: 4 inches plus or minus 1 inch.
 - 5. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of trowel-finished floor slabs to exceed 3 percent.

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94/C94M, and furnish batch ticket information.

1. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing Option: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, construct, erect, brace, and maintain formwork according to ACI 301.
- B. Construct wood forms of sound material of correct shape and dimensions, mortar tight, braced and tied together. Construct forms so that they may be easily removed without damage to the concrete.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 STEEL REINFORCEMENT INSTALLATION

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Bend and cut bars accurately. Bend bars cold; heating of bars not permitted. Do not bend or straighten bars in a manner that will injure the material.
- C. Placing: Place reinforcing steel in accordance with applicable requirements of references specified. Install reinforcement accurately and secure against movement.
 1. Reinforcing Supports: Support reinforcing bars above earth by concrete blocks or other approved non-corrodible supports. Space chairs and accessories to conform to CRSI's "Recommended Practice for Placing Bar Supports".
 2. Placing and Tying: Set reinforcing in place, space, and rigidly and securely tie or wire with 16 gage steel tie wire in the position directed.

3.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

3.5 CONCRETE PLACEMENT

- A. Comply with ACI 301 for placing concrete.
- B. Do not add water to concrete during delivery, at Project site, or during placement.
- C. Consolidate concrete with mechanical vibrating equipment according to ACI 301.
- D. Equipment Bases and Foundations:
 - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - 2. Construct concrete bases 4 inches high unless otherwise indicated; and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 - 3. Minimum Compressive Strength: 3000 psi at 28 days.
 - 4. Install dowel rods to connect concrete base to existing concrete slab-on-grade. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.

3.6 FINISHING FORMED SURFACES

- A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch.
 - 1. Apply to concrete surfaces exposed to public view.

3.7 FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
 - 1. Do not further disturb surfaces before starting finishing operations.

- C. Slip-Resistive Broom Finish: Apply a slip-resistive finish to exterior concrete housekeeping pad platforms. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.8 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 305.1 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests: Perform according to ACI 301.
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

SECTION 06 10 53

MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Wood blocking and nailers.
3. Plywood backing panels.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 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.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. RIS: Redwood Inspection Service.
2. WCLIB: West Coast Lumber Inspection Bureau.
3. WWPA: Western Wood Products Association.

1.3 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the stone facing only to the extent specified by the reference. Refer to Section 01 42 00 for information concerning availability and use of references.

APA-The Engineered Wood Association (APA)
American Society for Testing and Materials (ASTM International)
American Wood-Preservers' Association (AWPA)
Redwood Inspection Service (RIS)
U.S. Department of Commerce Product Standard (PS)
West Coast Lumber Inspection Bureau (WCLIB)
Western Wood Products Association (WWPA)

1.4 ACTION SUBMITTALS

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

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Power-driven fasteners.
3. Post-installed anchors.
4. Expansion anchors.
5. Metal framing anchors.

B. Certificate of Compliance:

1. Wood Treatment Data: Submit chemical treatment manufacturer's instructions for handling, storing, installing and finishing of treated materials.
 - a. Preservative Treatment: For each type specified, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained and conformance with applicable standards.
 - b. Water Borne Treatment: Include statement that moisture content of treated materials was reduced to levels specified before shipment to project site.

C. Submittal procedures and quantities are specified in Section 01 33 00.

1.6 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Rough carpentry shall conform to the 2016 California Building Code (CBC) Title 24 Part 2, Chapter 23 - Wood.
2. Framing anchors and powder driven fasteners shall be furnished and installed in accordance with the manufacturer's current ICC Evaluation Services Report.

B. Grade Marks:

1. Identify each piece of structural lumber, including timbers 4" by 4" in size and larger, by the official grade mark of WCLIB, or WWPA. Provide qualified lumber grader at the site to stamp members that are not mill stamped.
2. Identify plywood by the official grade mark of APA.
3. Identify pressure preservative treated lumber and plywood with the official grade mark of an independent Testing Agency operating under the overview of the ALSC. Grade stamp shall state retention; statements on grade stamp such as "or to refusal" are not permitted.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the site in an undamaged condition.
- B. Store lumber and plywood at the site under cover or otherwise protected against exposure to weather, raised above the ground and out of contact with other damp or wet surfaces.
- C. Stack lumber and plywood and provide for air circulation within and around the stacks and under temporary coverings.
- D. For pressure treated lumber and plywood, provide spacers between courses to permit air circulation.

1.8 PROJECT CONDITIONS

- A. Cooperate with other trades in coordinating their work with the work of this section. Provide wood grounds, blocking and nailers where indicated or as required for integration of work of other trades into the structure.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber:
 - 1. Untreated Lumber: Maximum 19 percent except 25 percent for timbers 5" by 5" in size or larger.
 - 2. Treated Lumber: Maximum 19 percent, except 23 percent for timbers 5" by 5" in size or larger, after pressure treatment.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWWPA U1; Use Category UC2 for interior construction not in contact with ground, and Use Category UC3b for exterior construction not in contact with ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following.
 - 1. Wood sills and similar concealed members in contact with concrete.
 - 2. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

- A. Dimension Lumber: Provide lumber of the grades and species listed below for the various purposes, graded in accordance with WCLIB "Standard Grading Rules No. 17", WWPA "Western Lumber Grading Rules 2017", or WWPA "Redwood Standard Specifications for Grades of California Redwood Lumber," 2000 Edition, with updates.
 - 1. Sill Plates: No. 1 Grade, or better, pressure preservative treated Douglas Fir/Larch.
 - 2. Blocking, Nailers and Bracing: Standard or better grade Light Framing; No. 2 or better grade Structural Light Framing; or Stud grade of any commercial softwood species.
 - 3. Studs and Top Plates: No. 1 Grade Douglas Fir/Larch.
 - 4. Joists, Headers, Ledgers: No. 1 or better grade Joists and Planks of Douglas Fir/Larch.
 - 5. Rafters: No. 1 grade Structural Light Framing of Douglas Fir/Larch.
 - 6. Beams, Girders, and Stringers: No. 1 Grade Beams and Stringers of Douglas Fir/Larch.
 - 7. Columns and Posts: No. 1 Grade Posts and Timbers of Douglas Fir/Larch.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Furring.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber 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); WCLIB, or WWPA.
 - 6. Western woods; WCLIB or WWPA.
- C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels for mounting electrical, data or telephone equipment: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, 3/4-inch nominal thickness unless otherwise indicated.

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. 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 A 153/A 153M, or of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Screws for Fastening to Metal Framing: ASTM C 1002 or ASTM C 954, length as recommended by screw manufacturer for material being fastened.
- D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

Hilti, Inc.
Powder Power Tool Corp.; Drive-It
Ramset Fastening Systems; Ramset

- E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or ICC-ES AC58 for mechanical anchors in masonry and concrete; and ICC-ES AC193 or ICC-ES AC308 for adhesive anchors in masonry and concrete; as appropriate for the substrate.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.7 METAL FRAMING ANCHORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Simpson Strong-Tie Company Inc.
K. C. Metals Products; Superspeed Connectors
Silver Metal Products, Inc.
USP Structural Connectors.

- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
 - 1. Use for interior locations unless otherwise indicated.
- C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.

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

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Do not splice structural members between supports unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- G. 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.
- H. 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.
- I. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 1. Table 2304.10.1, "Fastening Schedule," in 2016 California Building Code.
 2. ICC-ES evaluation report for fastener.
- J. 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 WALL FRAMING

- A. Provide single plates at bottom and double at top, except as otherwise indicated. Stagger splices in top plates not less than 48-inches except as otherwise indicated. Reinforce plates on both sides which are cut for the passage of pipes and similar items, with 16-gage by 2-1/16" by 24" steel straps punched for 28-16d nails.

- B. Anchor sill plates of exterior and interior shear walls to concrete foundations with fasteners of size, length and spacing indicated. Unless otherwise indicated, anchor sill plates for other partitions to concrete floors with 0.145-inch diameter powder driven fasteners spaced not to exceed 32-inches on center, with a minimum penetration of 1-1/2 inches.
- C. Wherever treated sill plates are cut, drilled, or notched, treat each raw surface with a heavy brush coat of same chemical used for treatment or a preservative acceptable to the Architect and the DSA.
- D. Furnish and set columns and studding of size, spacings, and locations indicated. Unless indicated otherwise, studding for furring and partitions shall be nominal 2" by 4" set 16-inches on center. Extend cripples to the floor plates. Install blocking in studding over 8-feet tall at half height, and at ceiling lines, double-nailed at each end. Construct corners and intersections with not less than 3 studs.
- E. Frame openings with full height double jamb studs and headers of sizes indicated. Set headers on separate trimmer studs and nail securely.

3.3 WOOD BLOCKING AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

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

01/11/19

SECTION 06 20 00

FINISH CARPENRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior standing and running trim.
2. Exterior standing and running trim.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood furring, blocking and shims, required for installing wood trim, concealed within other construction before trim installation.
2. Section 09 91 00 - Painting: Finishing of all finish carpentry work.

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 00 for information concerning availability and use of references.

APA-The Engineered Wood Association (APA)
National Electrical Manufacturers' Association (NEMA)
U.S. Department of Commerce, National Institute of Standards and Technology
Woodwork Institute (WI):
1. "North American Architectural Woodwork Standards" current edition.
Wood Moulding and Millwork Producers Association (WMMPA)

1.3 ACTION SUBMITTALS

- A. Samples: Submit samples of millwork, exposed woods, and other finish materials and trim specified herein.
- B. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 QUALITY ASSURANCE

- A. Woodworking Standards: Manufacture finish carpentry in accordance with WI "NAAWS" current edition, grades as specified herein.
- B. Lumber and Plywood Standards: Meet the requirements of WI "NAAWS" current edition, grades as specified herein.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver materials until project construction is ready for installation. Provide a clean storage area as required by WI "NAAWS" current edition, Section 2 - Care and Storage.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Softwood Lumber: WI "NAAWS" current edition, Section 3 - Lumber, of grades and species specified for the various applications.
- B. Hardwood Lumber: WI "NAAWS" current edition, Section 3 - Lumber, of grades and species specified for the various applications.

2.2 EXTERIOR FINISH CARPENTRY

- A. Preservative Treatment: Except for items fabricated from all heart redwood or cedar, all items of exterior finish carpentry shall be given a brush-on or dip treatment of water repellant in accordance with WI "NAAWS" current edition. Treat units of woodwork after cutting, machining, sanding, gluing and assembling has been completed to the greatest extent possible. Coat surfaces cut after treatment with heavy brush coating of same preservative.
- B. Standing and Running Trim:
 - 1. Opaque Finish: Custom Grade of any softwood species for opaque finish in accordance with WI "NAAWS" current edition, Section 6 - Interior and Exterior Millwork.

2.3 INTERIOR FINISH CARPENTRY

- A. Standing and Running Trim:
 - 1. Opaque Finish: Custom Grade of any softwood species for opaque finish in accordance with WI "NAAWS" current edition, Section 6 - Interior and Exterior Millwork.
- B. Stock Moldings: Provide stock molding patterns graded under WMMPA WM 4-2004, complying with sections indicated, P-Grade for opaque finish. Provide material as specified herein for standing and running trim.

2.4 HARDWARE

- A. Nails, bolts, washers, nuts, wood screws, lag screws, other fasteners, shall be best suited for their specific condition. Nails shall be steel, common or finished, as required.

2.5 MISCELLANEOUS MATERIALS

- A. Finish carpentry, millwork and miscellaneous items and their related components that are to be furnished are not necessarily individually described. Furnish and install finish carpentry

work and miscellaneous items not mentioned or otherwise described in accordance with the intent of the drawings and specifications and as required to complete the work.

- B. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 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.
- 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 finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 - 3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.

4. Coordinate finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.
- C. Back cut end joints in trim members approximately 85 degrees to provide a tight, straight butt joint and stagger joints at least 24-inches apart.
- D. Wherever possible, work materials to completion in the shop. Deliver parts of fabricated items to the site in as few pieces as possible. Fabricate mullions, heads, sills, and jambs in one piece wherever possible. Provide joints within each piece as unapparent as possible.
- E. Members that indicate checking or warping will be rejected. Poor grain combinations will also be rejected on parts that are to be exposed in the work.
- F. Install assembled items in the work carefully and neatly. Scribe as required for tight, straight, fit. Do not force installation. Shim as required for straight, level and plumb finished surfaces.
- G. Wherever possible, set nails in a manner that will leave them unseen in the final work. Do not drive exposed nails home, but set for putty with the proper sized nail set. Hammer marks on finished surfaces will be cause for rejection. Use wood screws only where heads are to be covered by other materials and where they will remain out of sight in the finished work.
- H. Priming and Backpriming: Prime and backprime wood surfaces as specified under Section 09 91 00 and in accordance with WI "NAAWS" current edition. Perform priming and backpriming before such products are installed in the work. Receive proper inspection of all surfaces before additional work is started.
- I. Protect all parts from injury after installation in the work and maintain protection until completion of the entire Project.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. 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. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 1. Install interior trim after gypsum-board joint finishing operations are completed.
 2. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 ADJUSTING

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

3.6 CLEANING

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

3.7 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

03/05/19

SECTION 07 21 00
THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Glass-fiber blanket.
 - 2. Mineral-wood blanket.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 07 84 13 "Penetration Firestopping" for mineral wool firestopping insulation.
 - 2. Section 07 84 43 "Joint Firestopping" for mineral wool firestopping insulation.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 00 for information concerning availability and use of references.
 - American Society for Testing and Materials (ASTM International)
 - U.S. General Services Administration, Federal Specification (FS)
 - Underwriters Laboratories (UL)

1.3 DESCRIPTION OF INSULATION SYSTEMS

- A. Thermal insulation within wood framed roof construction:
 - 1. Type: Fire resistant, kraft-foil faced, mineral fiber batts or blankets except aluminum foil faced mineral fiber batts or blankets may be used where insulation is fully concealed as defined in 2016 California Building Code (CBC) Title 24 Part 2, Section 2602.
 - 2. Thickness: As required to obtain an R-value of not less the R-19.
 - 3. Surface Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.
 - 4. Installation Method: Stapled to inside face of joists or rafters.
- B. Sound retardant insulation within interior partitions:
 - 1. Type: Unfaced glass fiber or mineral wool batts or blankets.
 - 2. Thickness: Match nominal stud depth (3-1/2Not less than 5-1/2 inches.

3. Surface Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.
4. Installation Method: Friction fit between studs.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 INFORMATIONAL SUBMITTALS

- A. Certificates of Conformance: Submit certificates from the manufacturer stating that materials meet the R-value and fire resistance and surface burning characteristics specified herein.

1.6 REGULATORY REQUIREMENTS

- A. Fire Performance Characteristics: Where insulation is used within a fire rated wall assembly, provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, in accordance with methods specified below, by UL or other testing and inspecting agency acceptable to State Fire Marshal.
 1. Surface Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 2. Fire Resistance Ratings: ASTM E119.
 3. Combustibility: ASTM E136.
- B. Certificate: As required by CBC Title 24, post a certificate containing the building permit number and the insulation manufacturer's name, material identification and R-value and stating that the insulation has been installed in accordance with the drawings and specifications.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver insulation to the site in unopened containers labeled with the manufacturer's name and brand designation and R-value rating.
- B. Store insulation in a dry, well ventilated, water-tight enclosure providing protection from damage. Do not store plastic insulation where it will be exposed to sunlight or to sources of ignition.

1.8 SEQUENCING AND SCHEDULING

- A. Do not install insulation until construction has progressed to the point that inclement weather will not damage or wet the insulation material.
- B. Install insulation after electric wiring, plumbing and other concealed work is in place.

- C. Insulation shall not be closed in until it has been inspected and approved.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CertainTeed Corporation; www.certainteed.com
 - 2. Johns Manville; www.jm.com
 - 3. Knauf Insulation; www.knaufinsulation.us
 - 4. Owens Corning; www.owenscorning.com
- B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- C. Glass-Fiber Blanket, Reinforced-Foil Faced: ASTM C665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
- D. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:
 - 1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
 - 2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

2.3 MINERAL WOOL BLANKETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CertainTeed Corporation; www.certainteed.com
 - 2. Johns Manville; www.jm.com
 - 3. Owens Corning; www.owenscorning.com
 - 4. Thermafiber, Inc.; www.thermafiber.com
 - 5. Roxul Inc.; www.roxul.com
- B. Mineral-Wool Blanket, Unfaced, ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

- C. Mineral-Wool Blanket, Reinforced-Foil Faced: ASTM C665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less per ASTM E84); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

2.4 AUXILIARY INSULATING MATERIALS

- A. Duct Tape: As recommended by the insulation manufacturer.
- B. Wire Mesh: Wire mesh shall be hexagonal zinc-coated steel poultry netting having a 1-1/2 inch mesh size and 0.048-inch diameter (18-gage) wire, conforming to ASTM A390.
- C. Line Wires: Soft annealed steel with light zinc coated finish not lighter than 16-gage.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

4. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
 - a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
- C. Unfaced Batts and Blankets: Where insulation is cut to fit small or irregular spaces, cut the insulation slightly larger than the space to ensure a tight friction fit. Insert blankets between the studs from the inside face of the wall, recessed slightly from the face of the studs. Where blankets are not adequately supported by friction, attach the blankets with adhesive, 9/16-inch long divergent point staples located at four corners and center of each blanket, or with tie wires spaced not more than 36-inches on center.
- D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

3.4 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

01/11/19

SECTION 07 42 13.19

INSULATED METAL SPANDREL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Metal spandrel panels for installation in aluminum storefront. Panels consist of metal skins laminated to stabilizer substrates with an insulating core material. Panels are designed to be glazed into a window system.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 08 43 13 – Aluminum-Framed Entrances: Metal spandrel panels used as infill glazing.
 - 2. Section 08 80 00 – Glazing: Glazing sealant.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the formwork only to the extent specified by the reference. Refer to Section 01 42 00 for information concerning availability and use of references.
- B. American Architectural Manufacturers Association (AAMA)
 - 1. 605.2-92 High Performance Organic Coatings on Aluminum - (Kynar)
- C. ASTM International:
 - 1. ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls and Doors under the influence of wind loads.
 - 2. ASTM D1781 - Climbing Drum Peel Test for Adhesives.
 - 3. ASTM D3363 - Method for Film Hardness by Pencil Test.
 - 4. ASTM D2794 - Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
 - 5. ASTM D3359 - Method for Measuring Adhesion by the tape test.
- D. Porcelain Enamel Institute (P.E.I.):
 - 1. ASTM-C-282 - Spot Acid.
 - 2. ASTM-C-283 - Boiling Acid.
 - 3. ASTM-C-703 - Antimony Chloride Spall Test.
 - 4. ASTM-C-346 - Gloss Retention.
 - 5. ASTM-C-486 - Spall Resistance.
 - 6. Brinell Hardness - 600-700.

1.3 SUBSTITUTIONS

- A. The materials and products specified in this section establish a minimum standard of required function, design, appearance quality and warranty to be met by any proposed substitution.

1.4 ACTION SUBMITTALS

- A. Submittal procedures and quantities are specified in Section 01 33 00 – Submittal Procedures.
- B. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- C. Shop Drawings: Include information not fully detailed in manufacturer's standard product data and the following:
 - 1. Layout and installation details, including anchors.
 - 2. Full-size section details of typical composite members.
 - 3. Installation details.
- D. Samples:
 - 1. Panel makeup: 2 samples, each 10" x 10".
 - 2. Two samples of each color and finish texture: 3" x 5".

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Panel manufacturer shall have a minimum of 25 years experience.
- B. Field measurements shall be taken prior to completion of manufacturing and cutting.
- C. Maximum deviation from vertical and horizontal alignment of installed panels is 1/8" in 20 feet, non-commutative.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver infill panels and accessories in manufacturer's original packaging, clearly identified with manufacturer's name, name and type of product, and finish.
- B. Store panels off the ground in an upright position, protected from the weather and other sources of damage.
- C. Handle to prevent twisting and other damage.
- D. Comply with additional requirements of the manufacturer.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Check openings by accurate field measurement before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INSULATED METAL SPANDREL PANELS – LAMINATED.

- A. Laminated metal faced panels as manufactured by Mapes Industries, Inc.; www.mapes.com
 - 1. Basis-of-Design Product for Non-Rated Spandrel Panel: Mapes-R™ Insulated Composite Panel.
- B. Acceptable alternatives: Panels having similar composite construction and finish providing manufacturer has a minimum of 25 years panel laminating experience and comparable published warranties.
- C. Manufacturer shall produce the steel skin and laminate the panel in the same controlled manufacturing environment.

2.2 PANEL FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Composition: Two sheets of steel bonded to stabilizer substrates with an insulative core.
- C. Exterior Substrate: 1/8" tempered hardboard.
- D. Core: 2-lb density polystyrene, 3/4 inch thick.
- E. Interior Substrate: 1/8" tempered hardboard.
- F. Steel Faces: Manufacturer's standard thickness.

- G. Tolerances: 0.8% of panels dimension length and width; $\pm 1/16$ " thickness.
- H. Panel Thickness: Nominal 1" thick.
- I. R-Value: 4.58.
- J. U-Value: 0.22.

2.3 FINISH

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. 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 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.
- C. Galvanized Steel (smooth) with manufacturer's standard Kynar/Hylar - AAMA 665.2-92-resin based - 70% painted finish.
- D. Color: Custom color as selected by Architect from manufacturer's full range.

2.4 ACCESSORIES

- A. Recommended for use as an infill panel component in window systems. Related material to complete installation as recommended by the manufacturer.
- B. Seals against moisture intrusion as recommended by the manufacturer. Polyurethane and silicone based sealants with a 20 year life are recommended.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Panel surfaces shall be free from defects prior to installation.
- B. Inspect framed openings before beginning installation.

3.2 INSTALLATION

- A. Comply with manufacturer's specifications and recommendations for installation of panels.
- B. Erect panels plumb, level and true.
- C. Glaze panels securely and in accordance with approved shop drawings and manufacturer's instructions to allow for necessary thermal movement and structural support.
- D. Do not install panels that are observed to be defective including warped, bowed, dented, scratched and delaminating components.

- E. Weatherseal all joints as required using methods and materials as previously specified.
- F. Separate dissimilar metals using gasketed fasteners and blocking to eliminate the possibility of electrolytic reaction.
- G. Install panels in accordance with Section 08 80 00.

3.3 CLEANING

- A. Remove masking film as soon as possible after installation. Masking intentionally left in place after panel installation will be the responsibility of the contractor.
- B. Clean panel surfaces promptly after installation. Exercise care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt and other substances.

3.4 PROTECTION

- A. Initiate and maintain protection and other precautions required through the remainder of the construction period to ensure that infill panels will be free of damage or deterioration at time of Final Acceptance.

END OF SECTION

01/11/18

SECTION 07 84 13

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."
 - 3) FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products; www.3m.com/firestop
 - b. Hilti, Inc.; www.hilti.com
 - c. The RectorSeal Corporation; www.rectorseal.com
 - d. Specified Technologies, Inc.; www.stifirestop.com
 - e. Tremco, Inc.; www.tremcosealants.com
 - f. U.S. Gypsum Company; www.usg.com
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.

2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
 3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
- D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
- F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
1. Permanent forming/damming/backing materials.
 2. Substrate primers.
 3. Collars.
 4. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.
- K. 3M Fire Barrier CP25WB+ Sealant: High-performance, intumescent, water-based sealant. No-sag, fast drying, paintable, red in color. Versatile firestop sealant for pipes (not for use with CPVC), cables, cable tray, blank opening and other penetrations along with mineral wool or other fire-rated assembly products.
 - 1. Fire Resistance: For use in 1, 2, 3 or 4 hour fire-rated systems.
 - 2. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.
 - 3. STC rating of 54 when tested in STC 54-rated wall assembly.
- L. 3M Fire Barrier IC 15WB+ Sealant: General-purpose, intumescent, water-based sealant. No-sag, fast drying, paintable, yellow in color. Economical firestop sealant for pipes, cables, cable tray, blank opening and other penetrations along with mineral wool or other fire-rated assembly products.
 - 1. Fire Resistance: For use in 1, 2 or 3 hour fire-rated systems.
 - 2. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.
 - 3. STC rating of 54 when tested in STC 54-rated wall assembly.
- M. 3M Fire Barrier Water Tight Sealant 3000 WT: Single-part, water-tight, intumescent silicone firestop sealant for filling voids in concrete gypsum, metal, plastic, wood and insulation. Light gray color with black flecks. Meets UL Water Leakage Test, W Rating – Class 1 requirements.
 - 4. Fire Resistance: For use in 1, 2, 3 or 4 hour fire-rated systems.
 - 5. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.
 - 6. STC rating of 53 when tested in STC 54-rated wall assembly.
- N. 3M Fire Barrier Moldable Putty+: One-part, 100 percent solids intumescent firestop. Remains pliable, flexible and easily re-enterable. Non-toxic synthetic formula. Versatile putty for pipes, cables, cable tray, blank opening and other penetrations along with mineral wool or other fire-rated assembly products.
 - 1. Type: Stick or Pad.
 - 2. Fire Resistance: For use in 1, 2 or 3 hour fire-rated systems.
 - 3. Locations: Vertical assemblies, horizontal assemblies and smoke barrier.

2.4 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."

2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Penetration Firestopping System for Metallic Pipes, Conduit, or Tubing:
 1. UL-Classified Systems: W-L-1001.
 2. F Ratings: 1, 2, 3 and 4 Hr.
 3. T Ratings: 0, 1, 2, 3, and 4 Hr.
 4. L Rating At Ambient: Less than 1 CFM/sq ft.
 5. L Rating At 400 Deg F: Less than 1 CFM/sq ft.
 6. Type of Fill Material: 3M Company, Fire Barrier CP 25WB+ Sealant, or FB-3000 WT sealant.
- C. Penetration Firestopping System for Metallic Pipe or Conduit Through Concrete Floor or Wall Assembly:
 1. UL-Classified System: C-AJ-1027. (Formerly System No. 202)
 2. F Rating: 3 Hr.
 3. T Rating: 0 Hr.
 4. Type of Fill Material: 3M Company, MP+ Stix moldable putty material.
- D. Penetration Firestopping System for Metallic Pipe or Conduit in Concrete:
 1. UL-Classified Systems: C-AJ-1044.

2. F Ratings – 2, 3, and 4 Hr.
3. T Rating – 0 Hr L Rating At Ambient – 2 CFM/sq ft.
4. L Rating At 400 F – less than 1 CFM/sq ft.
5. W Rating – Class 1.
6. Forming Material: 3M Fire Barrier Packing Material.
7. Type of Fill Material: 3M Company, CP 25WB+ Sealant, or FB-3000 WT Sealant. (W Rating applies only when FB-3000 WT is used.)

END OF SECTION

01/11/19

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Sealant work, except as otherwise specified, required to weatherproof the buildings, and including interior sealant work. This section contains requirements pertaining to all weather and interior sealant work throughout the project and becomes a part of each and every section calling for sealant and calking, unless otherwise specified, as though written in full in each section.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 07 84 43 "Joint Firestopping" for sealants for joint firestopping systems.
 - 2. Section 08 80 00 "Glazing" for sealants for glazing work.
 - 3. Section 09 29 00 "Gypsum Board" for sealing perimeter systems.

1.2 REFERENCES

- A. The editions of ASTM International Standards referenced herein apply to the work only to the extent specified by the reference thereto. Refer to Section 01 42 00 for information concerning availability and use of references.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint sealant product. Submit copies of manufacturer's specifications, recommendations and installation instructions for each type of sealant and related material required.
- B. Samples: Submit samples indicating the color range available for each sealant material intended for installation in locations exposed to view. Materials installed before approval of color will be subject to removal and replacement with approved material.
- C. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.
 - 1. Include manufacturer's letter of certification, or certified test reports indicating that each material complies with the requirements specified herein and is suitable for the applications indicated.
 - 2. Include manufacturer's letter of certification indicating that sealants, primers and cleaners comply with regulations controlling use of volatile organic compounds.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Obtain joint sealants from a single manufacturer for each different product required. Obtain elastomeric sealants only from manufacturers who will, if required by the Architect, send a qualified technical representative to the Project site to advise the installer of proper procedures and precautions for the use of these materials.
- B. Installer's Qualifications: Employ a firm having a minimum of 5 years successful experience in the application of the types of materials required.
- C. Regulatory Requirements. The quantity of volatile organic compounds (VOC) used in sealants, primers and cleaners shall not exceed the limits permitted under the current regulations for architectural coatings of the Bay Area Air Quality Management District.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sealants to the Project site in unopened containers, labeled with the manufacturer's name, brand designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi component materials.
- B. Store sealants in an area where they will not be subject to temperatures above 100 degrees F or below 40 degrees F. Do not store materials that have exceeded the manufacturer's recommended shelf life.

1.7 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

- A. Provide an extended warranty under the provisions of Section 01 78 36.
- B. Warrant work under this section against moisture penetration for a period of 5 years from the date of "Substantial Completion". The written warranty shall include materials and labor required to repair leaks that develop. The warranty shall be signed by the sealant manufacturer, the sealant installer and the Contractor.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SEALANT MATERIALS

- A. Type A Sealant: Multiple component, self-leveling polyurethane based sealant meeting the requirements of ASTM C920, Type M, Grade P, Class 25. Acceptable products or equal:

Pecora Corp.; Urexpam NR-200
Sika Corp.; Sikaflex-2c-SL
Sonneborn Building Products; Sonolastic SL 2
Tremco, Inc.; Vulkem 445 SSL

- B. Type B Sealant: Single or multiple component, nonsag polyurethane based sealant meeting the requirements of ASTM C920, Type S or M, Grade NS, Class 25. Do not use single component sealants when excessive movement is expected within the curing time of the sealant. Acceptable products or equal:

BASF MasterSeal NP 1 or NP 2
Pecora Corp.; Dynatrol I or II
Sika Corp; Sikaflex 1a or 2c-NS Ez-Mix
Tremco; Dymonic FC or Dymeric 240 FC

- C. Type C Sealant: Butyl rubber based sealant meeting the requirements of ASTM C920, Type S, Grade NS, Class 7.5. Acceptable products or equal:

Adco Seal; No. B-100
Pecora Corp.; BC-158
PTI Sealants; PTI 757
Tremco; Butyl Sealant

- D. Type D Sealant: Latex acrylic based sealant meeting the requirements of ASTM C834. Acceptable products or equal:

Pecora Corp.; AC-20
Sonneborn Building Products; Sonolac
Tremco; Acrylic Latex 834

- E. Type E Sealant: Medium modulus silicone sealant meeting the requirements of ASTM C920, Type S, Grade NS, Class 50. Acceptable products or equal:

Dow Corning Corp.; No. 795
Momentive; Silpruf SCS 2000
Sika Corp; SikaSil 295
Tremco, Inc.; Spectrem 2

- F. Type F Sealant: Narrow joint seam sealant meeting the requirements of AAMA 803.3-1976 and formulated for sealing joints 3/16-inch or smaller in width. Acceptable product or equal:

PTI Sealants; PTI 200

- G. Type G Sealant: Multiple component, nonsag polysulfide or polyurethane based sealant meeting the requirements of ASTM C920, Type M, Grade NS, Class 25, Use I, recommended by the manufacturer for continuously submerged joints. Acceptable products or equal:

L.M. Scofield Co.; Lithoseal Watercalk-3G
Sika Corp.; Sikaflex 2c NS Ez-Mix
Tremco, Inc. Dymeric 240 FC

- H. Acoustical Sealant: Sealant shall be one of the following types at the Contractor's option:
1. Polyvinyl chloride foam tape with pressure sensitive tape on one side 3/4-inch wide by the thickness required to accommodate unevenness of substrates and completely fill openings between partition framing and building floors and concrete or masonry wall. Acceptable products or equal:

Norton Co.; Norseal V730 Series
Arlon; Series 6A
 2. Permanently resilient compound manufactured specifically for acoustical applications. Acceptable products or equal:

Ohio Sealants; Sound Calk (solvent type)
Pecora Corp.; BA-98
Tremco; Acoustical Sealant

2.3 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin, or Type O (open-cell material), as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 1. Profile: Round in shape, with diameter never less than 30 percent greater than width of joint.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the joint surfaces, backing, and anchorages of units forming sealant rabbet, and the conditions under which the sealant work is to be performed for conditions that would adversely affect the performance of the sealant.
- B. Do not proceed with the sealant work until unsatisfactory conditions have been corrected. Start of sealant work constitutes acceptance of conditions.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Portland-Cement Plaster
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 JOINT DIMENSIONS

- A. Butyl Base Type Sealant: Minimum joint width of 1/4-inch, and the depth of 3 times the width of the joint, with the maximum depth 3/4-inch.
- B. Silicone Rubber Sealant: Minimum joint width of 1/4-inch, and depth of approximately one-half the width, but in no case less than 1/4-inch. Other width-to-depth ratios as follows:

JOINT WIDTH:

JOINT DEPTH:

For Nonporous Surfaces:

Minimum

Maximum

1/4" (minimum)	1/4"	1/4"
1/4" to 1/2"	1/2 of width	Equal to width
Over 1/2"	Not Permitted	

For Porous Surfaces

1/4" (minimum)	1/4"	1/4"
1/4" to 1/2"	1/4"	Equal to width
1/2" to 1"	1/2"	Equal to width
Over 1"	Not Permitted	

- C. Acrylic and Polyurethane: Minimum joint width of 1/4-inch, and depth equal to width, but in no case deeper than 1/2-inch. Other width-to-depth ratios as follows:

JOINT WIDTH:

JOINT DEPTH:

For Nonporous Surfaces:

Minimum

Maximum

1/4" (minimum)	1/4"	1/4"
1/4" to 1/2"	Equal to width	Equal to width
Over 1/2" to 1" maximum	1/2"	1/2"

For Porous Surfaces

1/4" (minimum)	1/4"	1/4"
1/4" to 1/2"	1/4"	Equal to width
1/2" to 1"	1/2"	1/2"
Over 1"	Not Permitted	

3.4 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide flush joint profile unless otherwise indicated, according to Figure 8B in ASTM C 1193. Rounded off finishing will not be allowed.
- G. Seal around all openings in exterior walls, and other locations indicated or required for waterproofing the buildings. Seal all other joints as herein specified, indicated, and required to properly complete the buildings.
- H. Apply sealants using specified materials and proper tools. Prepare surfaces (cleaning, etc.) and apply sealant as specified herein and in accordance with the manufacturer's printed instruction and recommendations.
- I. Do not use sealants when they become too jelled to be discharged in a continuous flow from the gun. Modification of sealants by addition of liquids, solvents, or powders will not be permitted.
- J. Apply sealants with guns having proper size nozzles. Use sufficient pressure to fill all voids and joints solid. In sealing around openings, include entire perimeter of each opening, unless indicated or specified otherwise. Where the use of the gun is impracticable, use suitable hand tools.
- K. Neatly point sealed joints on flush surfaces with beading tool, and internal corners with eaving tool. Remove excess material. Sealant, where exposed, shall be free of wrinkles and uniformly smooth. Complete sealing before final coats of paint are applied.

3.5 MISCELLANEOUS JOINT SEALING WORK

- A. The entire extent of sealing work is not necessarily fully or individually described herein. Provide sealing wherever required to prevent light leakage as well as moisture leakage. Refer to drawings for conditions and related parts of the work.

3.6 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.7 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.8 SEALANT APPLICATION SCHEDULE

- A. Type A Sealant: Use for all joints in exterior and interior concrete and ceramic and quarry tile floors and paved surfaces subject to foot traffic.
- B. Type B Sealant: Use for all vertical joints in masonry, plaster, and concrete, exposed on the exterior of the building and for sealing around metal door, window and louver frames penetrating these surfaces.
- C. Type C Sealant: Use for interior wall penetrations for pipe or conduit that will be concealed by escutcheons or other trim or plates and for lap joints in sheet metal work.
- D. Type D Sealant: Use for joints, voids, and penetrations in interior surfaces exposed to view and requiring painting.
- E. Type E Sealant: Use for all joints in contact with organically coated aluminum and for joints between precast and tilt-up concrete panels.
- F. Type F Sealant: Use for all narrow joints in aluminum storefront and curtain wall framing where joints are mechanically restricted from movement.
- G. Type G Sealant: Use for joints between window frames and other materials, and at other exterior joints for which no other sealant is indicated.
- H. Acoustical Sealant: Use to seal all perimeter joints around sound retardant partitions and around electrical boxes and other penetrations in these partitions.

END OF SECTION

01/11/19

SECTION 08 12 13
HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Interior standard steel frames.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 08 14 16 "Flush Wood Doors."
 - 2. Section 08 71 00 "Door Hardware."
 - 3. Section 09 91 00 "Painting" for field applied finish.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the references. Refer to Section 01 42 00 for information concerning availability and use of references.

American National Standards Institute (ANSI)
ASTM International (ASTM)
National Association of Architectural Metal Manufacturers (NAAMM)
Steel Door Institute (SDI)

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or 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, and access control and security systems.
- C. Coordinate work with frame opening construction, door and hardware installation.
- D. Sequence installation to accommodate required door hardware.
- E. Verify field dimensions for factory assembled frames prior to fabrication.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each frame type.
 - 2. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 3. Locations of reinforcement and preparations for hardware.
 - 4. Details of each different wall opening condition.
 - 5. Details of anchorages, joints, field splices, and connections.
 - 6. Details of accessories.
- C. Templates: Secure templates from finish hardware supplier for specified hardware and mounting locations.
- D. Product Schedule: For hollow-metal 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.
- E. Submittal procedures and quantities are specified in Section 01 33 00.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal frame assembly, for tests performed by a qualified testing agency.

1.7 QUALITY ASSURANCE

- A. Provide frames meeting the requirements of either SDI A250.8 or NAAMM HMMA 861 for standard sizes and designs.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal 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 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. Mark or tag each frame with the appropriate opening identification symbol.

1.9 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace hollow metal frames that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Amweld Building Products, Inc.; www.blackmountaindoor.com
Ceco Corp.; www.cecodoor.com
Curries Company; www.curries.com; an Assa Abloy Group company.
Door Components; www.doorcomponents.com
Forderer Cornice Works; www.fordererdoors.com
Republic Builders Products Corporation; www.republicdoor.com
Steelcraft Manufacturing Co.; www.steelcraft.com
Titan Metal Products; www.titanmetalinc.com
Substitutions: Section 01 25 00 – Substitution Procedures.

2.2 INTERIOR STANDARD STEEL FRAMES

- A. Construct hollow-metal frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra Heavy-Duty Frames: SDI A250.8, Level 3.
1. Physical Performance: Level A according to SDI A250.4.
2. Frames:
- 1) Materials: ASTM A1008, uncoated, steel sheet, minimum thickness of 16 gauge (0.053 inch).
- 2) Construction: Full profile welded, grind welds smooth.
3. Exposed Finish: Prime.

2.4 FRAME ANCHORS

- A. Jamb Anchors:
1. Type: Anchors of minimum size and type required by applicable door and frame standard, suitable for performance level indicated.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- C. Floor Anchors: Where indicated, provide floor anchors for each jamb and mullion that extends to floor. Form floor anchors from same material as frames, minimum thickness of 0.042 inch, and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

- D. Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

2.5 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- 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 C 665, 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 E 136 for combustion characteristics.

2.6 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. 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 same thickness metal as frames.
 - 1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 2. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 - 3. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and 9 inches from bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - b. Compression Type: Not less than two anchors in each frame.
 - c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

4. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - 1) Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - 2) Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- C. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- D. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to 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 applicable requirements in SDI A250.6, SDI A250.8, and BHMA A156.115 for preparation of hollow-metal work for hardware, except provide 8-gage minimum hinge reinforcement for exterior doors.

2.7 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 SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
- B. Field Finish: Field finish painting is specified in Section 09 91 00 "Painting."

2.8 CLEARANCES

- A. Provide doors and frames with clearances in accordance with SDI A250.8 or NAAMM HMMA 861.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.

- B. Drill and tap frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
- B. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - 1) Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - 2) Install frames with removable stops located on secure side of opening.
 - 3) Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - 4) Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
- C. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - 1) Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
- D. Solidly pack mineral-fiber insulation inside frames.
- E. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - 1) Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2) Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - 3) Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4) Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. 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.

END OF SECTION

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SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with MDO faces.
2. Shop priming flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 08 12 13 "Hollow Metal Frames".
2. Section 08 71 00 "Door Hardware".
3. Section 08 80 00 "Glazing" for glass view panels in flush wood doors.
4. Section 09 91 00 "Painting" for field finishing doors.

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the references. Refer to Section 01 42 00 for information concerning availability and use of references.

American National Standards Institute (ANSI)
ASTM International (ASTM)
Window and Door Manufacturers Association (WDMA)
National Fire Protection Association (NFPA)
Woodwork Institute (WI)

1.3 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, and trim for openings.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.

C. Samples for Verification:

1. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
2. Frames for lite openings, 6 inches long, for each material, type, and finish required.

- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.
- B. Quality Standard Compliance Certificate: WI Certified Compliance Program certificates.

1.5 QUALITY ASSURANCE

- A. Certification: Before delivery to the project site, issue a WI Certified Compliance Certificate indicating that the wood doors furnished fully meet requirements of the grade specified.
 - 1. After completion issue a WI Certified Compliance Certificate for Installation.

1.6 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. Deliver doors to the site after plaster and concrete are dry and the building has reached the average prevailing relative humidity of the locality.
- C. Mark each door on top rail with opening number used on Shop Drawings.
- D. Storage and Handling: Store doors in an area where there will be no great variation in temperature or humidity. Stack doors flat on 2" by 4" lumber laid 12-inches from ends and across the center. To protect surfaces, provide plywood or cardboard under the bottom door and over the top of the stack. Do not drag doors across one another.

1.7 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 ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.8 WARRANTY

- A. Provide an extended warranty under the provisions of Section 01 78 36.
- B. Furnish to the Owner a written warranty against defects in workmanship and materials including delamination in any degree, warp or twist of 1/4-inch or more in any 3'-6" by 7'-0" section of a door, telegraphing of any part of core assembly through face veneer to cause surface variation of 1/100-inch or more in a 3-inch span, defects which impair and affect performance of the door. Replacement under this warranty shall include hanging, installation of hardware and finishing. The warranty shall be signed by the door manufacturer and the Contractor.
- C. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Algoma Hardwoods, Inc.; www.algomahardwoods.com
Eggers Industries; www.eggersindustries.com
Oregon Door; www.oregondoor.com
Oshkosh Architectural Door Company; www.oshkoshdoor.com
Marshfield DoorSystems; www.marshfielddoors.com
VT Industries, Inc.; www.vtindustries.com
Substitutions: Section 01 25 00 – Substitution Procedures.

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

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."

1. Provide WI Certified Compliance Labels indicating that doors comply with requirements of grades specified.

- B. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

- C. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-2 as required to meet WDMA Performance Duty level specified without added blocking.

- D. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 lbf.
 - b. Screw Withdrawal, Edge: 400 lbf.

2.3 DOORS FOR OPAQUE FINISH

- A. Interior Solid-Core Doors:

1. Grade: Custom.
2. Faces: MDO.
 - a. Apply MDO directly to high-density hardboard crossbands.
3. Exposed Vertical Edges: Any closed-grain hardwood.
4. Core: Particleboard or Structural composite lumber.
5. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.

2.4 LITE FRAMES

- A. Metal Frames for Lite Openings: Provide glazed openings with not lighter than 0.0359-inch (20-gage) hot or cold rolled steel glazing stops. Stops shall be nonremovable on exterior or corridor side of door, custom color as selected by the Architect. Glass and glazing materials and methods are specified in Section 08 80 00. Acceptable products, or equal:

Anemostat Door Products; www.anemostat.com; LoPro-G

- B. Glass and Glazing: Specified in Section 08 80 00.

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
 - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- C. Openings: Factory cut and trim openings through doors.
 - 1. Lite 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 80 00.

2.6 SHOP PRIMING

- A. Doors for Opaque Finish: Shop prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in Section 09 91 00 "Painting."

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 71 00 "Door Hardware".
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

3.3 ADJUSTING

- A. Operation: Correct any deficiency that prohibits the door from swinging or operating freely. Do not remove hinge screws after initial insertion. Shims used for alignment purposes must be inserted between hinge and frame. Do not insert shims between hinge and door.
- B. To prevent stile failure, ensure that door closers are properly adjusted and do not limit the door opening swing. Limit door opening swing only with a properly located stop.
- C. 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

01/11/19

SECTION 08 43 13

ALUMINUM-FRAMED STOREFRONTS

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Storefront framing.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 06 10 53 "Miscellaneous Rough Carpentry".
 - 2. Section 07 92 00 "Joint Sealants".
 - 3. Section 08 80 00 "Glazing".

1.02 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 00 for information concerning availability and use of references.
 - Aluminum Association (AA)
 - ASTM International (ASTM)
 - American Architectural Manufacturers Association (AAMA)
 - California Association of Window Manufacturers (CAWM)
 - The Society for Protective Coatings (SSPC)

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
 - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 - 2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed storefronts, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
 4. Show fully detailed installation instructions/shop drawings for each type of component to be used within any adjoining system. Show anchorage (type and spacing) and system sealant/component application to provide waterproof system.
- C. Samples: Submit 12-inch long sample sections of aluminum extrusions and formed shapes showing color and finish. For color anodized components, submit two sets of two samples each, showing the extremes in color range.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Energy Performance Certificates: For aluminum-framed storefronts, accessories, and components, from manufacturer.
1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed storefront.
- C. Product Test Reports: For aluminum-framed storefronts, for tests performed by a qualified testing agency.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Sample Warranties: For special warranties.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed storefronts to include in maintenance manuals.

1.06 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain storefronts and finish through one source from a single manufacturer.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer. Installer/company will have a minimum of ten (10) years experience in performing work of this section and has specialized in the products installations.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

- D. Provide test reports from AAMA accredited laboratories certifying the performances as specified in paragraph 2.02.C.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver aluminum entrance and storefront components in the manufacturer's original protective packaging.
- B. Store entrance and storefront sections out of contact with the ground and under a weather tight covering. Do not cover storefront and entrance sections with polyethylene film or similar coverings that will create a humidity chamber. If factory coated aluminum is protected with a strippable plastic film, remove the film before exposing the materials to direct sunlight.
- C. Protect factory-coated surfaces during shipping and handling to prevent scratching, gouging or other damage to the finish.

1.08 FIELD MEASUREMENTS

- A. Secure accurate field measurements required for the manufacture and installation of aluminum entrance and storefront work.
- B. Consult with the various trades whose work adjoins this work and be responsible for all measurements and the working out of all details.

1.09 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:

1. Arcadia, Inc., www.arcadiainc.com
 2. Kawneer Company, Inc.; www.kawneer.com
 3. EFCO Corp; www.efcocorp.com
 4. Oldcastle Building Envelope; www.oldcastlebe.com
 5. Substitutions: Section 01 25 00 – Substitution Procedures.
- B. Basis-of-Design Product for Aluminum-Framed Storefront System: Arcadia, Inc., AFG451T Series, 2" x 4-1/2" Thermally broken; offset glazed system, screw spline, shear block, compensating stick or punched opening fabrication for 1" glass.

2.02 SYSTEM DESCRIPTION

- A. General: In addition to requirements shown or specified, comply with:
1. Applicable provisions of AAMA Aluminum Storefront and Entrance Manual for design, materials, fabrication and installation of component parts.
- B. Design Requirements: Arcadia AFG451T Series is a framing system that provides for flush glazing on all sides without projected stops, with glass forward or inward of the frame. Framing system suitable for outside or inside glazing.
- C. Performance Requirements:
1. Limit air leakage through assembly to 0.06 CFM/min/sq. ft. of wall area at 6.24 PSF as measured in accordance with ASTM E283.
 2. Water Resistance: No water leakage when measured in accordance with ASTM E331 with a static test pressure of 8 PSF.
 3. Limit mullion windload deflection of L/175 with full recovery of glazing materials, when measured in accordance with ASTM E 330.
 4. System shall not deflect more than 1/8" at the center point, or 1/16" at the center point of a horizontal member, once deadload points have been established.
 5. System shall accommodate expansion and contraction movement due to surface temperature differential of 180 degrees F.
 6. Seismic testing shall conform to AAMA recommended static test method for evaluating performance of curtain walls and storefront wall systems due to horizontal displacements associated with seismic movements and building sway.
 7. Thermal Performance: When tested in accordance with AAMA 1503.1 the following results should be attained: U-Maximum 0.63/CRF – minimum of 59.
 8. National Fenestration Rating Council (NFRC) specific application evaluation.

2.03 FRAMING MATERIALS AND ACCESSORIES

- A. Framing members, transition members, mullions, adaptors, and mounting: Extruded 6063-T6 aluminum alloy (ASTM B221 – Alloy G.S. 10a T6).
- B. Screws, fastening devices, and internal components: Aluminum, stainless steel, or zinc-plated steel in accordance with ASTM A164. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from aluminum.
- C. Glazing Gasket:
1. Compression-type design, replaceable, molded or extruded santoprene, polyvinyl chloride (PVC), or ethylene propylene diene monomer (EPDM).

2. Shall be of type that locks securely into the glazing reglet to prevent glazing gaskets from disengaging.

2.04 GLAZING

- A. Glazing: Glazing types as shown on Drawings. Comply with Section 08 80 00 "Glazing."
- B. Glazing Sealants: As recommended by manufacturer.

2.05 FABRICATION

- A. Provide continuous sub-sill under sill members to collect water infiltration and divert from the interior of the system.
- B. Internally reinforce framing members and secure at head and sill as necessary for structural performance requirements, for hardware attachment, and as indicated.
- C. Locate fasteners to ensure concealment from view in the final assembly.

2.06 ALUMINUM FINISH

- A. Finish all exposed areas of aluminum and components as indicated.
 1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm, or thicker.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine areas, 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.

3.02 INSTALLATION

- A. General:
 1. Comply with manufacturer's written instructions.
 2. Do not install damaged components.
 3. Fit joints to produce hairline joints free of burrs and distortion.
 4. Rigidly secure nonmovement joints.
 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 6. Seal perimeter and other joints watertight unless otherwise indicated.
- B. Metal Protection:
 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.

2. Where aluminum is in contact with concrete, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Set continuous sill members and flashing in full sealant bed as specified in Section 07 92 00 "Joint Sealants" to produce weathertight installation.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install glazing as specified in Section 08 80 00 "Glazing."

3.03 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed storefronts to comply with the following maximum tolerances:
 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
 - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
 4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.04 FIELD QUALITY CONTROL

- A. Field Quality-Control Testing: Perform the following test on representative area of exterior aluminum-framed storefronts.
 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration. Conduct testing in presence of the IOR. Correct deficiencies observed as a result of these tests.
- B. Aluminum-framed storefronts will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION

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SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes items known commercially as finish or door hardware that are required for swing doors.
- B. This Section includes the following, but is not necessarily limited to:
 - 1. Door Hardware.
 - 2. Thresholds, gasketing and weather-stripping.
 - 3. Door silencers or mutes.
- C. Related Sections: The following sections are noted as containing requirements that relate to this Section, but may not be limited to this listing.
 - 1. Section 08 12 13 - Hollow Metal Frames.
 - 2. Section 08 14 16 - Flush Wood Doors.

1.03 REFERENCES (USE DATE OF STANDARD IN EFFECT AS OF BID DATE.)

- A. 2016 California Building Code, CCR, Title 24.
- B. BHMA – Builders' Hardware Manufacturers Association
- C. DHI – Door and Hardware Institute
- D. WHI - Warnock Hersey Incorporated
- E. SDI - Steel Door Institute

1.04 COORDINATION

- A. 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.

1.05 PRE-INSTALLATION CONFERENCE

- A. Convene a pre-installation conference at least one week prior to beginning work of this section.
- B. Attendance: Architect, Construction Manager, Contractor, Hardware Supplier, Installer, Key District Personnel, and Project Inspector.

- C. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work. Review District's keying standards.

1.06 SUBMITTALS AND SUBSTITUTIONS

- A. General: Submit in accordance with Conditions of the Contract and Division 1 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 -1)					
			(a) 1 Single Door #1 - Exterior from Corridor 101	(b) 90°	(c) RH
			(d) 3' 0"x7' 0" x 1-3/4" x (e) 20 Minute (f) WD x HM		
(g) 1	(h)	(i) ea	(j) Hinges - (k) 5BB1HW 4.5 x 4.5 NRP (l) ½ TMS	(m) 626	(n) IVE
2	6AA	1 ea	Lockset - ND50PD x RHO x RH x 10-025 x JTMS	626	SCH

(a) - Single or pair with opening number and location. (b) - Degree of opening (c) - Hand of door(s) (d) - Door and frame dimensions and door thickness. (e) - Label requirements if any. (f) - Door by frame material. (g) - (Optional) Hardware item line #. (h) - Keyset Symbol. (i) - Quantity. (j) - Product description. (k) - Product Number. (l) - Fastenings and other pertinent information. (m) - Hardware finish codes per ANSI A156.18. (n) - Manufacture abbreviation.

- D. Make substitution requests in accordance with Division 1. 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. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.
- F. 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.

1.07 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals.
- B. Schedules: Final door hardware and keying schedule.
- C. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, manufacturers' installation and adjustment and maintenance information.

1.08 QUALITY ASSURANCE

- A. Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.
- B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
 - 1. Responsible for detailing, scheduling and ordering of finish hardware.
 - 2. Meet with Owner to finalize keying requirements and to obtain final instructions in writing.
 - 3. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.
- C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.
- D. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

1.09 DELIVERY, STORAGE AND HANDLING

- A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.
- B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.
- C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.
- D. Contractor to inventory door hardware jointly with representatives of hardware supplier and hardware installer until each all are satisfied that count is correct.

1.10 WARRANTY

- A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:

1. Locksets: Ten (10) years.
2. Closers: Thirty (30) years.
3. All other hardware: Two (2) years.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

<u>Item</u>	<u>Manufacturer</u>	<u>Acceptable Substitutes</u>
Hinges	Ives	Hager, Stanley, McKinney
Locks, Latches & Cylinders	Schlage	Or Approved Equal
Closers	LCN	Or Approved Equal
Stops	Ives	Trimco, BBW, DCI
Overhead Stops	Glynn-Johnson	Or Approved Equal
Thresholds	Zero	Pemko, National Guard

2.02 MATERIALS

- A. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.
1. 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: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.
 2. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.
- B. Heavy Duty Cylindrical Locks and Latches: Schlage "ND" Series as scheduled with "Rhodes" design, fastened with through-bolts and threaded chassis hubs.
1. 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 Test: 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.

2. Cycle life: Tested to minimum 16 million cycles per ANSI/BHMA A156.2 Cycle Test with no visible lever sag or use of performance aids such as set screws or spacers.
3. UL 10C for 4'-0" x 10'-0" 3-hour fire door.
4. Cylinders: Refer to "KEYING" article, herein.
5. Provide solid steel anti-rotation through bolts and posts to control excessive rotation of lever.
6. Provide lockset that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.
7. Provide locks with standard 2-3/4 inches backset, unless noted otherwise, with 1/2 inch latch throw capable of UL listing of 3 hours on a 4' x 10' opening. Provide proper latch throw for UL listing at pairs.
8. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
9. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
10. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
11. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.

C. Closers: LCN as scheduled. Place closers inside building, stairs, room, etc.

1. Door closer cylinders shall be of high strength cast iron construction with double heat treated pinion shaft to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.
2. All door closers shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 11/16 inch and piston diameter of 1 inch to ensure longevity and durability under all closer applications.
3. All parallel arm closers shall incorporate one piece solid forged steel arms with bronze bushings. 1-9/16" steel stud shoulder bolts, shall be incorporated in regular arms, hold-open arms, arms with hold open and stop built in. All other closers to have forged steel main arms for strength, durability, and aesthetics for versatility of trim accommodation, high strength and long life.
4. All parallel arm closers so detailed shall provide advanced backcheck for doors subject to severe abuse or extreme wind conditions. This advanced backcheck shall be located to begin cushioning the opening swing of the door at approximately 45 degrees. The intensity of the backcheck shall be fully adjustable by tamper resistant non-critical screw valve.
5. Closers shall be installed to permit doors to swing 180 degrees.
6. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees F. to -30 degrees F. without requiring seasonal adjustment of closer speed to properly close the door.
7. Provide the manufactures drop plates, brackets and spacers as required at narrow head rails and special frame conditions. NO wood plates or spacers will be allowed.
8. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Per 11B-404.2.8.1, door shall take at least 5 seconds to move from an open position of 90 degrees to a position of 12 degrees from the latch jamb.

D. Door Stops:

1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.

2. Door stops may protrude 4" maximum from face of the wall or be mounted a minimum of 78" A.F.F. (CBC Section 11B-307.4 Vertical Clearance.)
3. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

E. Thresholds: As Scheduled and per details.

1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope.
2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Section 07 92 00 "Joint Sealants."
3. Use 1/4" diameter fasteners, red-head flat-head sleeve anchors (SS/FHSL).
4. Thresholds shall comply with CBC Section 11B-404.2.5.

F. 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.

2.03 KEYING

- A. Furnish a Schlage masterkey system as directed by the Owner or Architect.
- B. A detailed keying schedule is to be prepared by the Owner and/or Architect in consultation with a representative of the lock manufacturer. 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. Establish a new masterkey system for this project as directed by the keying schedule.
- D. Furnish all cylinders in the Schlage conventional style except the exit device and removable mullion cylinders which will be supplied in Schlage Full Size Interchangeable Core (FSIC). Pack change keys independently (PKI).
- E. Furnish construction keying for doors requiring locking during construction.
- 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.

2.04 FINISHES

- A. Generally to be satin chrome US26D (626 on bronze and 652 on steel) unless otherwise noted.
- B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US32D (630) unless otherwise noted.
- C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.
- D. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

2.05 FASTENERS

- A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.
- B. Screws for butt hinges shall be flathead, countersunk, full-thread type.
- C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.
- D. Provide expansion anchors for attaching hardware items to concrete or masonry.
- E. All exposed fasteners shall have a phillips head.
- F. Finish of exposed screws to match surface finish of hardware or other adjacent work.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.
- B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.
- B. Use the templates provided by hardware item manufacturer.
- C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 34" and 44" AFF.
- D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- F. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.

3.03 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Clean adjacent surface soiled by hardware installation.
- C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore

proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

- D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.
- E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.04 HARDWARE LOCATIONS

- A. Conform to CCR, Title 24, Part 2; and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

3.05 FIELD QUALITY CONTROL

- A. Contractor is responsible for providing the services of an Architectural Hardware Consultant (AHC) or a proprietary product technician to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturers' instructions and as specified herein.

3.06 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 (Mfr.)

GLY =	Glynn-Johnson Corporation	Overhead Door Stops
IVE =	Ives	Hinges, Pivots, Bolts, Coordinators, Dust Proof Strikes, Kick Plates, Door Stops & Silencers
LCN =	LCN	Door Closers
SCH =	Schlage Lock Company	Locks, Latches & Cylinders
ZER =	Zero International	Thresholds, Gasketing & Weather-stripping

HARDWARE GROUP NO. 01

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50PD RHO	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	188S-BK	S-BK	ZER

END OF SECTION

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SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass for doors and storefront framing.
2. Glazing sealants and accessories.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Requirements:

1. Section 08 14 16 "Flush Wood Doors."
2. Section 08 43 13 "Aluminum-Framed Storefronts."

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 00 for information concerning availability and use of references.

American National Standards Institute (ANSI)
ASTM International (ASTM)
American Architectural Manufacturers Association (AAMA)
Glass Association of North America (GANA)
Insulating Glass Certification Council (IGCC)
Underwriter's Laboratories, Inc. (UL)

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. IBC: International Building Code.

D. Interspace: Space between lites of an insulating glass unit.

E. Sealed Insulating Glass Unit Surface Designations:

1. Surface 1 – Exterior surface of the outer glass lite.
2. Surface 2 – Interspace surface of the outer glass lite.
3. Surface 3 – Interspace surface of the inner glass lite.
4. Surface 4 – Interior surface of the inner glass lite.

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of the following products; 12 inches square.
 - 1. Insulating glass.
- C. Glazing Accessory Samples: For gaskets and sealants in 12-inch lengths.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- E. Submittal procedures and quantities are specified in Section 01 33 00.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturers of insulating-glass units with sputter-coated, low-E coatings.
- B. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements. For solar-control low-e-coated glass, provide documentation demonstrating that fabricator of coated glass is certified by coating manufacturer.
- C. Product Test Reports: Submit test reports from the manufacturer of the tinted and insulating glasses demonstrating compliance with the performance requirements of this section.
- D. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Glass and glazing shall conform with the 2016 CBC Title 24 Part 2 Chapter 24 - Glass and Glazing, and to Consumer Product Safety Commission regulation (CPSC) 16 CFR, Part 1201.
 - 2. Where safety glass is indicated or required, provide glazing materials that conform to ANSI Z97.1-2004 and CPSC16CFR, Part 1201 and are so identified in accordance with 2016 CBC Title 24 Part 2 Sec. 2406.3.
 - 3. The quantity of volatile organic compounds (VOC) used in primers, sealers and cleaners shall not exceed the limits permitted under the current regulations for architectural coatings of the Bay Area Air Quality Management District, South Coast Air Quality Management District, and CHPS Credit Number EQ2.2.
- B. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

- C. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Do not deliver glass to the site until the areas to be glazed are ready to receive the glass. Deliver glass in manufacturers storage cases with interleaving between lights. Deliver glazing compound in manufacturer's original cartons with labels intact.
- B. Storage: Store glass in original storage cases. Store cases in a dry, well ventilated area with temperatures maintained above the dew point. Do not store glass where it will be exposed to direct sunlight.
- C. Handling: Do not unpack glass until needed for installation. Handle and install materials in a manner to prevent breakage, scratching or other damage. Keep vacuum cups free from foreign material that would scratch glass.
- D. Take special care to prevent damage to factory clean cut edges of reflective glass, and tinted glass during delivery, storage, and handling.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.10 WARRANTY

- A. Provide an extended warranty under the provisions of Section 01 78 36.
- B. Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Clear Float Glass: Acceptable manufacturers or equal:

AGC Flat Glass, Inc.; www.agc.com

Guardian Industries Corp.; www.guardian.com

Viracon, Inc.; www.viracon.com

Vitro Architectural Glass (formerly PPG Glass); www.vitroglazings.com

B. Insulating Glass: Acceptable manufacturers or equal:

AGC Flat Glass, Inc.; www.agc.com
Guardian Industries Corp.; www.guardian.com
Interpane Glas Industrie AG; www.interpane.com
Oldcastle Glass Co.; www.oldcastlebe.com
Viracon, Inc.; www.viracon.com
Vitro Architectural Glass (formerly PPG Glass); www.vitroglazings.com

C. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

1. Obtain insulated glass from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: Defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.

1. Design Wind Pressure: 25 psf.

C. Where glass thicknesses are not indicated, provide thickness based on the wind pressures required by the 2016 California Building Code (CBC) Title 24 Part 2, Sec. 1609A. Wind pressure shall be assumed to have one-minute duration. Upon first application of design wind load for the specified durations, probability of breakage shall not exceed 0.008. Probability of breakage relative to glass thermal stress shall not exceed 0.008.

D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
3. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Glazing Manual."
 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, Kind HS heat-strengthened float glass, or Kind FT fully tempered float glass. Where heat-strengthened float glass is indicated, provide Kind HS heat-strengthened float glass or Kind FT fully tempered float glass. Where fully tempered glass is indicated, provide Kind FT fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear), Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190, and complying with other requirements specified. Insulating glass units shall be certified through the IGCC program for conformance to the Class CBA requirements of ASTM E774. Sealants used in the manufacture of insulating glass shall be fully compatible with glazing sealants specified.
1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
 2. Perimeter Spacer: Manufacturer's standard spacer material and construction.
 3. Desiccant: Molecular sieve or silica gel, or blend of both.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Vitro Architectural Glass Solarban® 70XL Solar Control Low-E Glass, or comparable product by one of the following:
1. Guardian Industries Corp.; www.sunguardglass.com; SunGuard SuperNeutral or High Performance & Solar, solar control insulated coated glass.

2. Substitutions: Section 01 25 00 "Substitution Procedures."

C. Both lites of insulating glass units shall be tempered.

2.6 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Color of Exposed Glazing Sealants: Black.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use G. The sealants shall be compatible with the sealant used in the insulated glass assembly.

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
3. Acceptable products or equal:

Pecora Corp.; Extru-Seal Preshimmed Tape
Protective Treatments Inc.; PTI 303 Spacer Rod Tape
Tremco; Preshimmed 440 Tape

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Clips for Metal Surrounds: Respective surround manufacturer's standard, (steel to steel, aluminum to aluminum, etc.).
- H. Preformed Gaskets: Closed cell sponge neoprene conforming to ASTM C509 and dense neoprene wedge gaskets conforming to ASTM C864. Gaskets shall be preformed to shapes and sizes to suit the glazing stops furnished with the doors, windows, storefront, and curtain wall system and to compress the sponge neoprene gasket 25 percent to 40 percent.

2.9 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

1. Manufacturer's labels, showing strength, grade, thickness, type and quality shall be required on each piece of factory cut glass. Labels shall remain on glass until it has been set, inspected, and reviewed.
 2. Sizes indicated are approximate. Actual sizes shall be determined by measuring in the field.
 3. Stops or beads for glazed openings are specified in other sections of these specifications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.
- L. Tempered Glass: Tong marks of tempered plate glass, when glazing, shall occur on the side of the narrow dimension only. When the long dimension of glass panes is vertical the tong marks shall occur at the bottom of the pane.
- M. Insulating Glass: Install insulating glass units in accordance with SIGMA "Recommended Practices for Vertical Field Glazing".

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant where indicated.
- G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 TESTS

- A. All exterior glazing shall be completely watertight, and water tests to prove this may be required at Contractor's expense.

3.8 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.9 INSULATED GLASS SCHEDULE

- A. Glass Type: Drawing Designation - Glass Type GT-1; Low-E Insulating Glass, low-reflective exterior appearance.
 - 1. Basis-of-Design Product: *Solarban*® 70XL (2) + Clear by Vitro Architectural Glass.
 - 2. Insulating Glass Unit Construction: 1/4 inch (6mm) glass, Solarban 70XL solar control (sputtered) on second surface (2) + 1/2 inch (13mm) air space + 1/4 inch (6mm) Clear glass.
 - 3. Performance Values:
 - a. Visible Light Transmission: 64 percent.
 - b. SHGC: 0.27.
 - c. Shading Coefficient: 0.32.
 - d. Outdoor Visible Light Reflectance: 12 percent.
 - e. U-Value Winter: 0.28.
 - f. U-Value Summer: 0.26.
 - g. Light to Solar Gain (LSG): 2.37
 - 4. Approved Manufacturers: Vitro Certified™ Fabricator Required.
 - 5. Certification: Both lites to be Cradle-to-Cradle Certified™, minimum Silver Level, by Cradle-to-Cradle Product Innovation Institute (www.c2ccertified.org).
 - 6. Outdoor Appearance: Low-reflective exterior appearance.
 - 7. Safety glazing required.

END OF SECTION

03/27/19

SECTION 09 05 61.13

MOISTURE VAPOR EMISSION CONTROL

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes: Fluid-applied, resin-based, membrane-forming systems that control the moisture-vapor emission rate of high-moisture, interior concrete to prepare it for floor covering installation. Apply to existing slab-on-grade concrete slab substrates that are scheduled to receive resilient flooring or sheet carpeting. Provide substrate suitable for installation of flooring by other sections to ensure provision of full warranty and service life of those finishes.
- B. Vapor control coating application for existing construction shall include shot blasting, coating application and cement topcoat layer to create a sustainable system for future flooring updates and replacements.
 - 1. Specialty curing, sealing, vapor-control coatings do not meet the intent of this section.
- C. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- D. Related Sections:
 - 1. Section 09 65 19 - Resilient Tile Flooring.
 - 2. Section 09 65 43 - Linoleum Flooring.
 - 3. Section 09 68 16 - Sheet Carpeting.

1.02 REFERENCES

- A. The editions of standards and specifications published by the following organizations, and referenced herein, apply to the work only to the extent specified by the reference. Refer to Section 01 42 00 for information concerning availability and use of references.
- B. ASTM International:
 - 1. ASTM C109 / C109M - 11b Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
 - 2. ASTM D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
 - 3. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
 - 4. ASTM E96 – Standard Test Methods For Water Vapor Transmission of Materials.
 - 5. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
 - 6. ASTM F710 – Standard Test Method for Preparing Floors To Receive Resilient Flooring.
 - 7. ASTM F1869 – Standard Test Method For Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

- 8. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In-Situ Probes.
 - B. California Department of Health Services – Section 01350 TVOC Testing.
- 1.03 DEFINITIONS
- A. MVE: Moisture vapor emission.
 - B. MVER: Moisture vapor emission rate.
- 1.04 PREINSTALLATION MEETINGS
- A. Preinstallation Conference: Conduct conference at Project site.
- 1.05 ACTION SUBMITTALS
- A. Section 01 33 00 – Submittals: Submittal procedures.
 - B. Specified Product:
 - 1. Product Data: Provide data for concrete floor cleaning, coating and preparation materials.
 - 2. Installation methods: Indicate procedures and process.
 - 3. Mixing data.
 - 4. Installer Certificate: Manufacturer's acceptance of applicator.
 - 5. Warranty: Submit manufacturer's standard warranty, as specified.
 - C. Alternate Products:
 - 1. Product Data: All products being used in the assembly of the control coating system.
 - 2. Installation Data: Indicate procedures and process.
 - 3. Laboratory Testing: Current independent laboratory reports. Reports shall be no greater than 2 years of age. Older test reports are not acceptable.
 - 4. Installer Certificate: Manufacturer's approved applicator's certificates for a warranted system.
 - 5. Warranty: Manufacturer's standard warranty certificate, including any and all exclusions.
 - 6. Insurance Certificate: Submit manufacturer's product liability insurance certificate. Refer to paragraph 1.10.D for dollar amount.
- 1.06 QUALITY ASSURANCE
- A. Coating Manufacturer Qualifications:
 - 1. Products with VOC content of less than 65 g/liter and which contribute to LEED points.
 - 2. Formula meets the California Department of Health Services emission chamber testing.
 - 3. Maintains long term warranty product liability insurance in the amount of \$6,000,000 per occurrence and capable of listing Owner as additionally insured.

4. Employs factory-trained personnel who are available for consultation and Project-site inspection.

1.07 DELIVERY, STORAGE, AND HANDLING

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

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Existing Construction: Maintain temperatures of 55 to 85 degrees, 72 hours prior to, during and after application.

1.09 WARRANTY

- A. Section 01 78 36 – Warranties: Requirements for warranties.
- B. Correct defective Work within a fifteen (15) year period after Date of Substantial Completion. Manufacturer's warranty shall cover vapor emission coating failure including but not limited to suppression of water vapor emission, alkalinity and migrating salts through concrete surfaces. Emission levels after application shall meet flooring manufacturer's tolerances.
 1. Installation over existing construction shall include a cement topcoat to provide a sustainable surface for future flooring updates and replacements to allow warranty coverage to be extended.
- C. For warranty repair work, remove and replace flooring products, and vapor emission coating; provide required preparation materials and labor.
- D. Manufacturer shall maintain product liability insurance in the amount of \$6,000,000 per occurrence prior to, during and after application process.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Provide products by one of the following manufacturers meeting specified requirements:
 1. Synthetics International; www.SyntheticsIntl.com "Synthetic30™"; Phone: (866) 646-0356.
 2. Diamond Stone Products; "Diamond-MTP" and "Diamond-VRS"; Phone: (888) 817-8663).
 3. Additional Manufacturers: None identified.
 4. Substitutions: Section 01 25 00 – Substitution Procedures.
- B. Basis-of-Design Product for Existing Slab-on-Grade Subfloors: Synthetic30™. Synthetic30 is a two-component waterborne polymer designed to penetrate concrete slabs and seal cracks, joints and slab imperfections. The special resins allow the polymers to saturate porous concrete and embed a dense, high compressive film

strength within the concrete to restrict water vapor emission, alkalinity migration and 100% relative humidity transfer. The product may be covered with a moisture sensitive flooring system or used as a stand-alone floor finish.

1. Synthetic30's polymers improve the adhesion of flooring products by forming a surface that is unaffected by alkalinity and maintains moisture compliance. Flooring systems applied over the treated surface will exceed applications over concrete alone for compatibility.

2.02 VAPOR EMISSION COATING – PERFORMANCE REQUIREMENTS

A. Coating shall be third party laboratory tested in accordance with the following:

1. Water Vapor Transmission - WRT:
 - a. ASTM E96 Grains/ft²/hr of less than 0.6
 - b. ASTM E96 Pounds/1000ft²/ 24 hours of less than 2.0
 - c. ASTM E96 grams/h · m² of less than 0.7
2. Water Vapor Permeance - WVP:
 - a. ASTM E96 Perms (inch-pounds) of less than 1.4
 - b. ASTM E96 Grams/Pa · s · m² x 10⁻¹⁰ of less than 8.1
 - c. ASTM E96 Nanograms/ Pa · s · m² of less than 81.1
3. Alkali Resistance - 30 days:
 - a. ASTM D1308 - Resistant to 35% potassium hydroxide exposure
 - b. ASTM D1308 – Resistant to 14pH solution exposure
4. Concrete Adhesion - Pull off:
 - a. ASTM D4541 Adhesion of 375 to 600psi (100% concrete cohesive failure)
5. Low Emitting - VOC Content:
 - a. EPA Method 24 testing of less than 62 g/liter
 - b. Meets requirements of LEED EQ Credit 4.1
 - c. Contains no formaldehyde, formaldehyde precursors and zero-carcinogens
 - d. Contains zero hazardous air pollutants (HAP's)
 - e. Meets Section 01350 - California Department of Health Services Standard practice requirements for classroom and office space.

B. Coating Properties: Liquid applied penetrant and coating for suppressing, controlling and restricting water vapor emissions of 15 pounds and alkalinity resistance of 14pH.

1. Shall be a two-component, two-coat application of a proprietary low viscosity, polymers which form a highly insoluble film property resistant to 14pH (ASTM D1308) and water vapor reduction of 95 percent (ASTM E96).
2. Remain resistant to 100% RH per ASTM F2170 In-Situ Relative humidity exposure.
3. Application shall maintain a water vapor emission rate of less than 2.0 lbs. per ASTM F1869 during warranty period.

2.03 ACCESSORIES

A. Moisture Tolerant Primer: Two-component, low viscosity liquid for chemically bonding cement products to vapor control coating surfaces.

- B. Crack-Filling Material: Resin-based material recommended in writing by MVE-control system manufacturer for sealing concrete substrate crack repair.
- C. Cement Topcoat: Portland cement, single-component floor prep product by RAECO Cements (877) 763-1330 www.raecoinc.com; or equal. Product shall be applied at a nominal 1/8-inch thickness.
- D. ASTM F1869 Water Vapor Emission Test Kits: American Moisture Test, Inc. (866/670-9700)

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify concrete substrate meets minimum product requirements for a warranted installation. Consult with manufacturer's technical personnel for acceptable conditions.
- B. Do not proceed with installation until conditions are acceptable.
- C. Existing Construction:
 - 1. Examine substrates and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of the Work.
 - 2. Verify substrates meet manufacturer's requirements before starting work.
 - 3. Verify items which penetrate substrate to receive coating are securely installed.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.
 - a. Installation of system indicates acceptance of surfaces and conditions.

3.02 PREPARATION - GENERAL

- A. Preinstallation Testing:
 - 1. Testing Agency: Owner will engage a qualified testing agency to perform tests.
 - 2. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Internal Relative Humidity Test: Using in situ probes, ASTM F 2170. Install MVE-control system in locations where concrete substrates exhibit relative humidity level greater than 75 percent.
 - 4. Tensile-Bond-Strength Testing: For typical locations indicated to receive installation of MVE-control system, install minimum 100-sq. ft. area of MVE-control system to prepared concrete substrate and test according to ASTM D 7234.
 - a. Proceed with installation only where tensile bond strength is greater than 200 psi with failure in the concrete.

3.03 PREPARATION – EXISTING CONSTRUCTION

- A. Concrete Substrates: Prepare and clean substrates according to MVE-control system manufacturer's written instructions to ensure adhesion of system to concrete.
- B. Remove foreign materials detrimental to system, such as curing compounds, sealers, loose patching materials or surface oil. Foreign materials shall be removed by shot blasting with #390 to #420 shot.
- C. Vacuum clean all surfaces to remove dust, debris and shot. Do not acid etch or use clean sweeping agents.
- D. Protect walls, floor openings, electrical openings, door frames, and other obstructions during installation.
- D. Seal all cracks, joints and slab imperfections in accordance with manufacturer's recommendations prior to coating installation.

3.04 MIXING

- A. Synthetic 30: Read all mixing data prior to use. Do not mix partial units. Follow manufacturer's written instructions.

3.05 APPLICATION - EXISTING CONSTRUCTION

- A. Apply to designated existing slab-on-grade substrates to restrict 100%RH per ASTM F2170 and alkalinity-pH of 14 in areas to receive finish flooring. No exceptions.
- B. General: Install MVE-control system according to ASTM F 3010 and manufacturer's written instructions to produce a uniform, monolithic surface free of surface deficiencies such as pin holes, fish eyes, and voids.
 - 1. Install primers as required to comply with manufacturer's written instructions.
- C. Verify that surfaces are solid, free of loose particles, cracks, pits, rough projections or foreign matter detrimental to maximum adhesion of the system.
- D. When surface temperatures exceed 80 deg F, pre-dampen concrete with clean water using an airless sprayer.
- E. Allow the product to completely saturate the surface (approx. 20 min); broom areas that puddle.
- F. Pour product on designated concrete surfaces; drag with a squeegee, lint-free nap roller and/or nylon broom to saturate the concrete surface.
- G. Apply coating to saturate surface, cracks and joints in accordance with manufacturer's spread rates and curing requirements.
- H. Surface may be walked on during application wearing spike shoes.
- I. Spread evenly over the entire surface following specified spread rates.
- J. Use fans to increase air movement after application.
- K. Verify concrete temperature and interior humidity to allow proper drying.

- L. Typical curing times at 75 deg F - 30% RH with proper ventilation:
 - 1. Latex/ Acrylic Adhesives: 12 hrs. Epoxy Products: 24 hours.
 - 2. Urethane Products: 24 hrs. Non-Porous Primer: 12 - 24 hours.
- M. Cure MVE-control system components according to manufacturer's written instructions. Prevent contamination or other damage during installation and curing processes.
- N. After curing, examine MVE-control system for surface deficiencies. Repair surface deficiencies according to manufacturer's written instructions.
- O. Install cement top-coat (patching-leveling product) over cured membrane if required to maintain manufacturer's warranty and in thickness required to maintain the warranty.
 - 1. Apply moisture tolerant primer to secure all cement patching-leveling products to MVE-control coating.
 - 2. Mix and apply cement topcoat product to provide a smooth floor surface for flooring. This surface will offer a sustainable surface for future flooring updates and replacements.

3.06 FIELD QUALITY CONTROL

- A. Substrates not within moisture requirements shall be re-coated to maintain compliance for flooring products.

3.07 PROTECTION

- A. Protect MVE-control system from damage, wear, dirt, dust, and other contaminants before floor covering installation. Use protective methods and materials, including temporary coverings, recommended in writing by MVE-control system manufacturer.
- B. Do not allow subsequent preinstallation examination and testing for floor covering installation to damage, puncture, or otherwise compromise the MVE-control system membrane.

END OF SECTION

01/11/19

SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Interior gypsum board construction and accessories.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Work:
 - 1. Section 07 21 00 "Thermal Insulation" for acoustical insulation.
 - 2. Section 07 84 13 "Penetration Firestopping" for penetration identification signage on gypsum board partitions.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference: Refer to Section 01 42 00 for information concerning availability and use of references.

American Society of Testing and Materials (ASTM International)
Gypsum Association (GA)
Technical Services Information Bureau (TSIB); formerly Western Lath/Plaster/Drywall
Industries Association (WLPDIA)
Western Wall and Ceiling Contractors Association (WWCCA)

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Certificates: Submit manufacturer's certification that products meet or exceed requirements of the referenced specifications.
- C. Samples:
 - 1. Textured Finishes: 12" x 12" size for each textured finish indicated and on same backing indicated for Work. Texture samples to match texture of existing gypsum board wall and ceiling textures.
- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 QUALITY ASSURANCE

- A. Field Samples: On actual gypsum board surfaces, prepare field samples of at least 100 square feet in surface area for the applications listed below. Simulate finished lighting conditions for review of in-place unit of work.
 - 1. Wall surfaces indicated or specified for non-textured finish.

2. Ceiling surfaces indicated or specified for non-textured finish.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver gypsum board and accessories in the manufacturer's original unopened containers, bundles or rolls bearing the manufacturer's name and brand designation.
- B. Store materials inside the building or in other dry weather tight enclosure. Stack gypsum board flat and off the floor. Do not stack long lengths over shorter lengths.
- C. Store flammable adhesives away from fire, sparks and smoking areas.
- D. Handle gypsum board to prevent damage to edges, ends, and surfaces.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install gypsum board until insulation, pipes, conduits, ducts, vents, supports and other items that will be concealed by the gypsum board have been inspected, tested and approved by the governing authorities and unsatisfactory conditions have been corrected.
- C. Do not install interior gypsum panels until installation areas are enclosed and conditioned.
- D. Do not install panels that are wet, moisture damaged, or mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and 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-Resistive Construction: Meet the requirements of CBC Title 24 Part 2 Chapter 7 - Fire and Smoke Protection Features and Chapter 8 - Interior Finishes.
 1. Fire-Resistant-Rated Assemblies: Provide fire-resistance rated assemblies identical to those in Chapter 7 of the CBC Title 24 Part 2 or in listing of other testing agencies acceptable to the State Fire Marshal.
 2. Fire Performance Characteristics: Provide finish materials meeting requirements of Chapter 8 Section 803 of the CBC Title 24 Part 2 and that have been tested and bear the UL label and marking, or marking of other testing agency acceptable to the State Fire Marshal, indicating the following fire performance characteristics tested in accordance with ASTM E84.
 - a. Flame Spread: Not more than 25.
 - b. Smoke Developed: Not more than 50.
- B. Fire Resistive Gypsum Board: Bear the Underwriter's Laboratories Inc. (UL) label or label of another organization acceptable to the State Fire Marshal.

- C. 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 MANUFACTURERS

- A. Acceptable manufacturers or equal:

CertainTeed Corp; www.certainteed.com
Georgia-Pacific Gypsum LLC; www.gp.com
National Gypsum Co.; Gold Bond Building Products Division;
www.nationalgypsum.com
USG Corporation: www.usg.com
PABCO Gypsum; www.pabcogypsum.com

2.4 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C1396: 5/8 in. thick unless otherwise shown or specified, with tapered edges and either rounded or beveled returns for prefilling. Where fire resistive ratings are shown use thickness required to comply with assembly fire testing of gypsum board partitions for fire rating required.

- 1. Acceptable products:

- a. USG Corporation Sheetrock Brand EcoSmart Firecode X panels; or equal.

- 1) As compared to the net use of fresh water value of 1.329 m³/1000 ft² in the Gypsum Association Industry Standard Type III EPD for North American Type X wallboard, wallboard uses a manufacturing process with a 25% or greater reduction in net use of fresh water value or a net use of fresh water value less than or equal to 1.0 m³/1000 ft² for wallboard manufactured west of the Mississippi River as listed in a product specific Type III EPD for North American Type X wallboard.
- 2) As compared to the global warming potential value of 317.4 kg CO₂-eq./1000 ft² in the Gypsum Association Industry Standard Type III EPD for North American Type X wallboard, wallboard uses a manufacturing process with a 21% or greater reduction in global warming potential or a global warming potential value of less than or equal to 232 kg [CO₂-eq./1000](#) ft² for wallboard manufactured west of the Mississippi River as listed in a product specific Type III EPD for North American Type X wallboard.
- 3) As compared to the primary energy from non-renewable resources value of 5,291 MJ/1000ft² in the Gypsum Association Industry Standard Type III EPD for North American Type X wallboard, wallboard uses a manufacturing process with a primary energy from non-renewable resources value less than or equal to 3,986 MJ/1000 ft² for wallboard manufactured west of the Mississippi River as listed in a product specific Type III EPD for North American Type X wallboard.

- b. G-P Gypsum Corp.; or equal.
 - c. National Gypsum Company; or equal.
 - d. CertainTeed Gypsum; or equal.
- B. Moisture- and Mold-Resistant Gypsum Board: ASTM C1396, 5/8 in. thick "Type X" unless otherwise shown or specified, with tapered edges and either rounded or beveled returns for prefilling. Where fire resistive ratings are shown use thickness required to comply with assembly fire testing of gypsum board partitions for fire rating required.
 - 1. Acceptable products:
 - a. United States Gypsum Co.; Sheetrock Brand EcoSmart Mold Tough Firecode X Panels, or equal.
 - 1) Wallboard uses a manufacturing process with a net use of fresh water value less than or equal to 1.35 m³/1000 ft² for wallboard manufactured west of the Mississippi River as listed per Product Category Rules for North American Gypsum Boards.
 - 2) Wallboard uses a manufacturing process with a global warming potential value of less than or equal to 268 kg CO₂-eq./1000 ft² for wallboard manufactured west of the Mississippi River as listed per Product Category Rules for North American Gypsum Boards.
 - b. CertainTeed Gypsum; M2Tech® gypsum board, or equal.
 - c. G-P Gypsum Corp.; Mold-Guard Gypsum Board, or equal.
 - d. National Gypsum Company; Gold Bond Brand XP Fire-Shield Gypsum Board, or equal.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
 - 1. Material: Paper-faced galvanized steel sheet.
 - 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.
 - d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - e. Expansion (control) joint.
 - f. Curved-Edge Cornerbead: With notched or flexible flanges.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.

2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping or drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use setting-type, sandable topping or drying-type, all-purpose compound.
4. Finish Coat: For third coat, use setting-type, sandable topping or drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound; drying-type, all-purpose compound; or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

2.7 AUXILIARY MATERIALS

- A. General: 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. Acceptable products or equal:
 1. OSI® F38 Drywall and Panel Adhesive; www.ositough.com
 2. Liquid Nails DWP Drywall Construction Adhesive; www.liquidnails.com
 3. Franklin International; Titebond Professional Drywall Adhesive; www.titebond.com
- C. Screws: Conform to the standards specified below for attaching gypsum board to the various substrates listed.
 1. Metal Framing, 20-Gage and Heavier: ASTM C954.
 2. Metal Framing and Furring, 25-Gage: ASTM C1002, Type S.
 3. Wood Framing: ASTM C1002, Type W.
 4. Gypsum Backing Board: ASTM C1002, Type G.
- D. Nails for attaching Gypsum Board to Wood Framing: ASTM C514.
- E. Sound Attenuation Blankets: As specified in Section 07 21 00 "Thermal Insulation."
- F. Acoustical Sealant: Specified in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine framing to ensure that corners and framing are plumb, true and solid and that framing members are properly spaced. Edges and ends of board shall have solid bearing.
- C. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. General: 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. 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.
- I. 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 C 919 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.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Use fire retardant, moisture- and mold-resistant gypsum board on walls within toilet rooms, and elsewhere as indicated.
 - 2. Use fire retardant gypsum board in all locations not otherwise indicated or specified.

B. Nonrated Single Layer Construction:

1. Apply gypsum board with the long dimension at right angles to ceiling framing and at right angles or parallel to wall framing members. Use maximum-length panels to minimize end joints.
2. Apply ceiling panels before wall/partition board application to the greatest extent possible.
3. Attach gypsum board with screws spaced 12 inches on center for ceilings and 16 inches on center for walls. Use 1-inch long screws for metal framing and furring and 1-1/4 inch long screws for wood framing.

C. Nonrated Double Layer Construction: Provide one of the following methods at the Contractor's option.

1. Mechanically Fastened Face Layer: Apply base layer with the long dimension at right angles to the framing members. Attach the base layer with screws spaced 24 inches on center. Use 1-inch long screws for metal framing and 1-1/4 inch long screws for wood framing. Apply face layer with long dimension at right angles to the base layer. Attach the face layer with screws 24 inches on center. Use 1-5/8 inch long screws.
2. Adhesive Applied Face Layer: Apply base layer with the long dimension at right angles to the framing members. Attach the base layer with screws of sizes and spacings as specified for single layer construction. Apply the face layer with long dimension perpendicular to the base layer. Laminate the face layer to the base layer with all-purpose joint compound applied to the back of the panel with a notched spreader. Hold the face layer in position until adequate bond is achieved using temporary fasteners or bracing. Remove temporary fasteners or bracing and fill all holes with joint compound as specified herein.

D. Rated Fire Resistive Partitions: Install and fasten gypsum board in accordance with CBC Title 24 Part 2 Table 721.1(2).

E. 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.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings. If no control joints are indicated, provide joints to ensure that unbroken wall surfaces are limited to 30-feet in length and unbroken ceiling surfaces are limited to 2500 square feet or 50-feet in either direction. Provide control joints in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use where indicated vertical and horizontal outside corners and angles.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.
4. U-Bead: Use at exposed panel edges where indicated.

- D. Edge Sealing: Cut edges, utility holes, and joints of water resistant gypsum board shall be treated with the gypsum board manufacturer's recommended waterproof sealant before installation.
- E. Tolerances: Gypsum board surfaces shall have a maximum variation of 1/8 inch in 10 feet when a straight edge is laid on the surface in any direction and no measurable variation in any 2-foot direction.

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, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Tape and finish joints, corners, fastener heads, and other imperfections in accordance with the manufacturer's specifications and recommendations to provide a smooth finish.
- E. Reinforce joints, wall and ceiling angles, and inside vertical corners with tape embedded in joint compound. Finish joints with not less than 2 applications of joint compound, allowing each application to dry thoroughly and sanding between coats as required.
- F. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840.
 - 1. Level 1: Provide for ceiling plenum areas and concealed areas, unless a higher level of finish is required for fire-resistive-rated assemblies and sound-rated assemblies. Where Level 1 gypsum board finish is indicated or specified, apply embedding coat of joint compound. Remove excess joint compound.
 - 2. Level 2: Not used.
 - 3. Level 3: Not used.
 - 4. Level 4: Provide for gypsum board surfaces indicated to receive light orange peel finishes before painting. Where Level 4 gypsum board finish is indicated or specified, embed tape in finishing compound plus 2 separate coats applied over joints, inside angles, fastener heads, and accessories using ready-mixed, drying type, all-purpose taping compound. Feather out third coat approximately 6-inches from center of joint. After drying, sand or otherwise treat each coat and after last coat of the compound to provide a smooth even surface.
 - 5. Level 5: Provide for gypsum board surfaces indicated to receive non-textured finish and semi-gloss enamels. Where Level 5 gypsum board finish is indicated or specified, embed tape in finishing compound plus 2 separate coats applied over joints, inside angles, fastener heads, and accessories using ready-mixed, drying type, all-purpose taping compound, plus a thin skim coat of joint compound over the entire gypsum board surface. After drying, lightly sand or otherwise treat the surface of the compound to provide a smooth even surface free of porosity or other surface variations.
- G. Treat external corners, edges, and ends with metal beads and edge trim. Finish with 3 coats of joint compound and feather out between 8-inches and 10-inches from the nose.

- H. The final application of compound and sanding shall leave all gypsum board surfaces uniformly smooth and in condition to receive specified finish.

3.6 REPAIR, CLEAN-UP AND 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.
- D. Repair fastener pops by driving a new fastener approximately 1-1/2 inches from the fastener pop and reset the popped fastener. When face paper is punctured, drive a new fastener approximately 1-1/2 inches from the defective fastener. Fill damaged surfaces with compound.
- E. Upon completion of the work, remove from adjacent surfaces, overspray, splatter and daubs of taping and finish compound and textured finishes. Remove tools, equipment, unused material and cuttings and leave the work in a clean orderly manner.

END OF SECTION

01/11/19

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Acoustical ceilings, including acoustical lay-in panels and suspension systems.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference: Refer to Section 01 42 00 for information concerning availability and use of references.

ASTM International (ASTM)
Acoustical Insulation Manufacturer's Association (AIMA)
Ceilings & Interior Systems Construction Association (CISCA)
DSA Interpretation of Regulations IR 25-2.13
General Services Administration Federal Specifications (Fed. Spec.)

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Submit manufacturer's catalog cuts, specifications, and other data for each component of the acoustical ceiling systems as necessary to demonstrate compliance with these specifications.
- B. Samples: Submit the following samples for review:
 - 1. 12-inch long samples of main tees, cross tees and perimeter molding.
 - 2. 6" by 6" samples of each type of acoustical units to be used in the work.
- C. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For each acoustical panel ceiling suspension system, from ICC-ES.

1.5 CLOSOUT SUBMITTALS

- A. Maintenance Data: For finishes 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. Acoustical Ceiling Panels: Full-size units equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed and concealed component equal to 2 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2 percent of quantity installed.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver acoustical units, suspension-system components, and accessories to Project site in original, unopened packages bearing the manufacturer's name, brand designation, and label verifying compliance with these specifications. Store materials in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Immediately before installation, store acoustical units for not less than 24 hours at the same temperature and relative humidity as the space where they will be installed.

1.8 PROJECT CONDITIONS

- A. Maintain a uniform temperature of not less than 60 degrees F nor more than 85 degrees F and a relative humidity of not more than 70 percent continuously from 24 hours before installation until 24 hours after completion of work.

1.9 SCHEDULING

- A. Wet operations such as plastering, concrete and masonry work shall be completed and dry before installation of acoustical ceilings. Mechanical, electrical and other work above the ceiling line shall be completed and approved before start of acoustical ceiling installation.

1.10 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace acoustical panel ceilings that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance Requirements: Furnish and install suspension systems in accordance with the suspension system manufacturer's current ICC Evaluation Services Report and 2016 California Building Code (CBC), Title 24 Part 2, Sec. 1607A.1; CBC Title 24 Part 2, Chapter 25 and Interpretation of Regulations IR 25-2.13 issued by the Division of the State Architect (DSA).
- B. Surface Burning Characteristics: Provide finish materials meeting requirements of Chapter 8 Section 803 of the 2016 CBC Title 24 Part 2 and that have been tested and bear the UL label and marking, or marking of other testing agency acceptable to the State Fire Marshal,

indicating the following fire performance characteristics tested in accordance with ASTM E84.

- a. Flame Spread Index: Not more than 25.
- b. Smoke Developed Index: Not more than 50.

2.2 ACOUSTICAL CEILING UNITS

A. General:

- 1. Low-Emitting Materials: Acoustical ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- 2. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.
- 3. Acoustical Materials: ASTM E1264, with features as specified below. Furnish each type specified from one manufacturer, with the color and texture identical throughout.
 - a. Acoustical materials shall contain a minimum of 30 percent of recycled materials.

B. Acoustical Lay-in Panels: Basis-of-Design product for drawing designation "ACP":

Armstrong World Industries; Ultima® Square Lay-in, Item No. 1910 HRC

- 1. Material: Wet-formed mineral fiber with DuraBrite® acoustically transparent membrane.
- 2. Surface Finish: DuraBrite with factory-applied white latex paint.
- 3. Surface Texture: Fine Texture.
- 4. Fire Performance:
 - a. ASTM E84 surface burning characteristics. Flame Spread Index 25 or less. Smoke Developed Index 50 or less (UL labeled).
- 5. ASTM E1264 Classification: Type IV, Form 2, Pattern E, Fire Class A.
- 6. Humidity/Sag Resistance: HumiGuard® Plus; superior resistance to sagging in high humidity conditions.
- 7. Mold/Mildew Protection: Ceiling panels with BioBlock® performance resist the growth of mold and mildew.
- 8. VOC Emissions: GREENGUARD Gold Certified. Product certified for low chemical emissions per UL.Com/GG UL 2818.
- 9. Noise Reduction Coefficient: Minimum 0.75.
- 10. Ceiling Attenuation Class: 35 DB; 11-frequency average.
- 11. Light Reflection Factor: 0.90.
- 12. Size: 24" by 24" by 3/4" thick.

13. Edge Detail: Square Lay-in.

2.3 SUSPENSION SYSTEM

- A. Exposed Lay-in System: Direct hung system meeting the requirements for Heavy Duty classification of ASTM C635 and E580 Section 5.1. Acceptable products or equal:

Armstrong; Prelude XL HD 7301 main runners and cross runners
Chicago Metallic; 200 main runners; 1204 cross runners
USG Interiors; DX26 main runners; DXO-216 cross runners

1. Main Runners and Cross Tees: Double web type of cold rolled steel with protective coating and with painted steel caps. Width of exposed faces shall be 15/16-inch.
2. Wall Moldings: Cold rolled steel with protective coating.
3. Intersections and Connections: Provide intersections and connections capable of withstanding a mean ultimate test load of 180 pounds or twice the actual load, whichever is greater, in tension when tested in accordance with ASTM C635.
4. Finish: Finish all exposed metal parts with a baked-on vinyl finish, matte white color except matte black where black ceiling panels are indicated.

2.4 ACCESSORIES

- A. Hanger Wires: Class 1 zinc coated (galvanized) carbon steel conforming to ASTM A641. Wire shall be #12 gage (0.106" diameter) with soft temper and minimum tensile strength = 70 ksi. The maximum allowable (ASD) tension load for wire meeting this specification is 350 pounds.
- B. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- C. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- D. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.
- E. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.
- F. Main Beam Splice Clip: Manufacturer's standard splice clip to reinforce main beam carrier where it is cut to make transition at top and bottom of sloped ceilings.

2.5 METAL EDGE MOLDINGS AND TRIM

- A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION OF CEILING SYSTEMS

- A. Comply with ASTM C636, Section 5.2 of ASTM E580, and manufacturer's written instructions.
- B. Place units as indicated on the drawings. Install with joints true and straight and junctures with ceilings, walls and openings neat and tight. Completed work shall present a smooth plane and level surface, free from unevenness, edge or corner offsets, cupping, scratches and other imperfections.
- C. Perform all cutting required for fixtures, pipes and other work passing through acoustical tile and panels. Neatly and tightly fit units to such work and adjoining work. Fit border units neatly and tightly against abutting surfaces. Replace loose and damaged tiles and panels when directed. Touch-up all damaged finishes. Leave all surfaces clean and free from marking and other disfigurement.
- D. #12 gage hanger wires may be used for up to and including a 4 foot by 4 foot grid spacing and shall be attached to main runners. Splices in hanger wires shall develop 50 percent of the wire allowable load.
- E. Hanger Wires: Space hanger wires as specified for each type of suspension system. Provide each hanger wire in one piece without splices.
 - 1. Anchor each wire to the structure above by one of the means detailed in CBC Sec. 25 and DSA IR 25-2.13. Bend hanger wires directly across the bulb of the main runner and tight against the connection device at supporting construction, then wrap the wire around itself in 3 tight wraps within 1-1/2 inches.
 - 2. Provide #12-gage hanger wires at the ends of all main and cross runners within 8 inches from the support or within 1/4 of the length of the end tee, whichever is least, for the perimeter of the ceiling area. Perimeter wires are not required when the length of the end tee is 8 inches or less.

3. Provide trapeze or other supplementary support members at obstructions to maintain hanger spacing. Provide additional hangers, struts or braces as required at all ceiling breaks, soffits or discontinuous areas. Hanger wires that are more than 1 in 6 out of plumb shall have counter-sloping wires.
 4. Ceiling grid members shall be attached to 2 adjacent walls per ASTM E580, Section 5.2.3. Ceiling grid members shall be at least 3/4-inch clear of other walls. If walls run diagonally to ceiling grid system runners, one end of main and cross runners shall be free, with a minimum of 3/4-inch clear at wall.
 5. The width of the perimeter supporting closure angle shall be not less than two inches. Use of perimeter angles with smaller widths in conjunction with proprietary perimeter clips may be acceptable in accordance with Section 5 of DSA IR 25-2.13.
 6. At the perimeter of the ceiling area where main or cross runners are not connected to the adjacent wall, provide interconnection between the runners at the free end to prevent lateral spreading. A metal strut or a #16-gage wire with a positive mechanical connection to the runner may be used and placed within 8 inches of the wall. Where the perpendicular distance from the wall to the first parallel runner is 8 inches or less, the stabilizer or #16 gage wire is not required.
- F. Install wall molding at the perimeter of the defined areas. Attach wall moldings to the wall at not more than 16-inches on center. On two adjacent walls attach each runner to the wall molding with a pop rivet. At opposite walls, provide metal struts or 16-gage wire with mechanical connection to the runner to prevent runners from spreading. Miter all corners of wall molding.
- G. Level the ceiling to within 1/8-inch in 10-feet in any direction.

3.4 LATERAL FORCE BRACING ASSEMBLY INSTALLATION

- A. Lateral force bracing assemblies consisting of a compression strut and four #12 gage splayed bracing wires oriented 90 degrees from each other are required for all ceiling areas.
1. Exception: Lateral force bracing may be omitted for suspended acoustical ceiling systems with a ceiling area not to exceed 144 square feet, for all values of SDS, when perimeter support is provided in accordance with Section 2.2 of IR 25-2.13 and perimeter walls are designed to carry the ceiling lateral forces.
- B. Lateral force bracing assemblies shall be spaced per Table 1 of IR 25-2.13 for all values of the component importance factor (Ip) of the ceiling.
- C. There shall be a brace assembly a distance of not more than one half of the above spacing from each surrounding wall, expansion joint and at the edges of any ceiling vertical offset. For example, where the brace spacing is 8' x 12', the edge distance shall be 4 feet in the direction of the 8 foot spacing and 6 feet in the direction of the 12 foot spacing.
- D. The slope of bracing wires shall not exceed 45 degrees from the horizontal plane and wires shall be taut. Splices in bracing wires shall develop the wire allowable load.
- E. Compression struts shall meet the following requirements:
1. The strut shall be sized to adequately resist the vertical component force induced by the ceiling bracing wires and have a maximum kl/r not to exceed 300. The struts listed in Appendix A meet this requirement for ceilings complying with the general requirements of IR 25-2.13.
 2. The strut shall not be more than one (horizontal) in six (vertical) out of plumb.

3.5 ATTACHMENT OF HANGER AND BRACING WIRES

- A. Fasten hanger wires with not less than 3 tight turns in 3 inches. Hanger wire loops shall be tightly wrapped and sharply bent to prevent any vertical movement or rotation of the member within the loops (see ASTM E580, Section 5.2.7.2).
- B. Fasten bracing wires with not less than 4 tight turns in 1-1/2 inches.
- C. Hanger and bracing wire anchorage to the structure shall be installed in such a manner that the direction of the anchorage aligns closely with the direction of the wire. (e.g. bracing wire ceiling clips must be bent as shown in the details and rotated as required to align closely with the direction of the wire, screw eyes in wood must be installed so they align closely with the direction of the wire, etc.).
- D. Separate all ceiling hanger and bracing wires at least 6 inches from all unbraced ducts, pipes, conduit, etc.
- E. Hanger and bracing wires shall not attach to or bend around obstructions including but not limited to: piping, ductwork, conduit and equipment. Provide trapeze or other supplementary support members at obstructions to allow typical hanger spacing. Brace assemblies must be configured and/or located in order to avoid obstructions in addition to maintaining the required brace assembly spacing.
- F. Provide additional hangers, struts and brace assemblies as required at all ceiling breaks, soffits, or discontinuous areas.
- G. Hanger wires that are more than one (horizontal) in six (vertical) out of plumb shall have counter-sloping wires. Note: See ASTM C636, Figure 1, for counter-sloping methods.
- H. Attachment of the bracing wires to the structure above and to the main runners shall be adequate for the load imposed. The weight (W_p) shall be taken as not less than 4 psf for calculating seismic forces (F_p).
- I. Post-installed anchors (e.g. expansion anchors, screw anchors and power actuated fasteners) shall have a current Evaluation Report acceptable to DSA in accordance with IR A-5.
- J. Power-actuated fasteners in concrete are not permitted for bracing wires.

3.6 CEILING FIXTURES, TERMINALS, AND DEVICES

- A. All fixtures, terminals, and other devices shall be mounted in a manner that will not compromise ceiling performance in accordance with Section 13.5.6.2.2 Item 5 of ASCE 7 as amended by CBC Section 1616A.1.20 (1616.10.16*) and ASTM E580 Sections 5.3 and 5.4.
- B. Ceiling panels shall not support any light fixtures, air terminals or devices.
- C. Penetrations through the ceiling for sprinkler heads and other similar devices that are not integrally tied to the ceiling system in the lateral direction shall have a 2-inch oversized ring, sleeve or adapter through the ceiling tile to allow free movement of 1-inch in all horizontal directions. Alternatively, per ASTM E580, Section 5.2.8.5, a flexible sprinkler hose fitting that can accommodate 1-inch of ceiling movement shall be permitted to be used in lieu of the oversized ring, sleeve, or adapter.
- D. Slack safety wires shall be considered hanger wires for installation and testing requirements.

3.7 LIGHT FIXTURES

- A. All light fixtures shall be positively attached to the ceiling suspension systems by mechanical means per CEC Article 410.36 to resist a horizontal force equal to the weight of the fixture. A minimum of two screws or approved fasteners are required at each light fixture, per ASTM E580, Section 5.3.1.
- B. Surface-mounted light fixtures shall be attached to the main runner with at least two positive clamping devices on each fixture. The clamping device shall completely surround the supporting ceiling runner and be made of steel with a minimum thickness of #14 gage. Rotational spring catches do not comply. A #12 gage slack safety wire shall be connected from each clamping device to the structure above. Provide additional supports when light fixtures are 8 feet or longer or exceed 56 lb. Maximum spacing between supports shall not exceed 8 feet.
- C. Light fixtures weighing less than or equal to 10 lb. shall have a minimum of one #12 gage slack safety wire connected from the fixture housing to the structure above.
- D. Light fixtures weighing greater than 10 lb. but less than or equal to 56 lbs. may be supported directly on the ceiling runners, but they shall have a minimum of two #12 gage slack safety wires connected from the fixture housing at diagonal corners to the structure above.
 - 1. Exception: All light fixtures greater than two by four feet weighing less than 56 lbs. shall have a #12 gage slack safety wire at each corner.
- E. All Light fixtures weighing greater than 56 lb. shall be independently supported by not less than four taut #12 gage hanger wires (one at each corner) attached from the fixture housing to the structure above or other approved hangers. The four taut #12 gage wires or other approved hangers, including their attachment to the structure above, shall be capable of supporting 4 times the weight of the fixture.

3.8 SERVICES WITHIN THE CEILING

- A. All flexible sprinkler hose fitting mounting brackets, ceiling-mounted air terminals or other services shall be positively attached to the ceiling suspension systems by mechanical means to resist a horizontal force equal to the weight of the component. Screws or approved fasteners are required. A minimum of two attachments are required at each component.
- B. Ceiling-mounted air terminals or other services weighing less than or equal to 20 lb. shall have one #12 gage slack safety wire attached from the terminal or service to the structure above.
- C. Flexible sprinkler hose fittings, ceiling-mounted air terminals or other services weighing more than 20 lb. but less than or equal to 56 lb. shall have two #12 gage slack safety wires (at diagonal corners) connected from the terminal or service to the structure above.
- D. Flexible sprinkler hose fittings, ceiling-mounted air terminals or other services weighing more than 56 lb. shall be supported directly from the structure above by not less than four taut #12 gage hanger wires attached from the terminal or service to the structure above or other approved hangers. The four taut #12 gage wires or other approved hangers, including their attachment to the structure above, must be capable of supporting four times the weight of the unit.

3.9 OTHER DEVICES WITHIN THE CEILING

- A. All lightweight miscellaneous devices, such as strobe lights, occupancy sensors, speakers, exit signs, etc., shall be attached to the ceiling grid per Section 2.6.2 a) of IR 25-2.13. In addition, devices weighing more than 10 lbs. shall have a #12 gage slack safety wire anchored to the structure above per Section 2.6.1 b) of IR 25-2.13. Devices weighing more than 20 lbs. shall be supported from the structure above using details provided by the registered design professional (RDP).

3.10 INSTALLATION OF ACOUSTICAL UNITS

- A. Install acoustical units with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
 - 2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 - 3. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.
 - a. Hold-Down Clips: Space 24 inches o.c. on all cross runners.
 - 4. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.11 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
- C. Remove all debris resulting from the work of this section.

END OF SECTION

01/11/19

SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Thermoset-rubber base.
 - 2. Resilient molding accessories.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 09 65 19 – Resilient Tile Flooring.
 - 2. Section 09 65 43 – Linoleum Flooring.
 - 3. Section 09 68 16 – Sheet Carpeting.

1.2 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. Use same designations indicated on Drawings.

1.3 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. 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.

1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and 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.

1.5 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.

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F in spaces to receive resilient products during the following time periods:
 1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 THERMOSET-RUBBER BASE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Armstrong World Industries.
 2. Burke Mercer Flooring Products; a division of Burke Industries Inc.
 3. Flexco.
 4. Roppe Corporation, USA.
 5. Johnsonite; A Tarkett Company.
- B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
 1. Style and Location:

- a. Style A, Straight: Provide in areas with carpet.
 - b. Style B, Cove: Provide in areas with resilient flooring.
- C. Thickness: 0.125 inch.
- D. Height: 4 inches unless otherwise noted; 6 inches where shown.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Preformed.
- G. Inside Corners: Preformed.
- H. Colors: As selected by Architect from full range of industry colors.

2.3 RUBBER MOLDING ACCESSORY

- 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. Armstrong World Industries, Inc.
 - 2. Burke Mercer Flooring Products; a division of Burke Industries Inc.
 - 3. Flexco.
 - 4. Johnsonite; A Tarkett Company.
 - 5. Roppe Corporation, USA.
- B. Description: Carpet edge for glue-down applications; reducer strip for resilient flooring; joiner for tile and carpet; and transition strips.
- C. Profile and Dimensions: As indicated.
 - 1. Stair Nosings Basis-of-Design product: Burke Mercer Flooring Products; #560 Double Butt Carpet Stair Nosing, or #565 Double Undercut Carpet Stair Nosing.
- D. Locations: Provide rubber molding accessories in areas indicated.
- E. Colors: As selected by Architect from full range of industry colors..

2.4 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.
 - 1. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 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. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are the same temperature as the 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.
- D. 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.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of 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 exposed 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.

END OF SECTION

01/11/19

SECTION 09 65 19

RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid vinyl floor tile.
2. Vinyl composition floor tile.

B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

C. Related Sections:

1. Section 9 05 61.13 – Moisture Vapor Emission Control.
2. Section 09 65 13 – Resilient Base and Accessories.

1.2 REFERENCES

A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 00 for information concerning availability and use of references.

ASTM International (ASTM)
General Services Administration Federal Specifications (Fed. Spec.)
National Fire Protection Association (NFPA)

B. National Fire Protection Association (NFPA):

1. NFPA 253 Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
2. NFPA 258 Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of resilient floor tile.

1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

C. Samples:

1. Tile: Submit full size samples of each different color and pattern of floor tile required.

D. Manufacturer's Installation Procedures: Submit a current copy of the flooring manufacturer's recommended standard installation procedure for each type of flooring material.

- E. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile 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. Furnish an additional one percent of each different resilient floor tile furnished on the project, to the Owner for repair purposes. Include the cost of this material in the contract price. Select material from the same run number as the material installed. Identify materials as to location used.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements. The quantity of volatile organic compounds (VOC) used for flooring installation shall not exceed the limits permitted under the current regulations of the Bay Area Air Quality Management District.
- B. Requirements for Physically Disabled: Provide resilient flooring that is stable firm, and meeting the slip resistant requirements of 0.5 minimum in accordance with ASTM D2047, the 2016 California Building Code (CBC) Title 24 Part 2; and 2010 ADA Standards for Accessible Design.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups for floor tile including resilient base and accessories.
 - a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.
 - 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.
- D. Pre-Installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements. Comply with Section 01 31 13 – Coordination and Project Meetings.

1.8 QUALIFICATIONS

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 65 deg F or more than 85 deg F, with a relative humidity between 40% and 60%. Store floor tiles on flat surfaces.

1.10 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 85 deg F in spaces to receive floor tile during the following time 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 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

1.11 WARRANTY

- A. Project Warranty: Refer to Section 01 78 36 – Warranties, for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
 - 1. Warranty Period for VCT: Five (5) year limited warranty commencing on Date of Substantial Completion.
 - 2. Warranty Period for LVT: Ten (10) year limited warranty commencing on Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class 1, > 0.45 W/sq. cm.

2. Smoke Density: Less than 450 per NFPA 258 (ASTM E 662).

2.2 SOLID VINYL FLOOR TILE (Drawing Designation LVT)

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. Basis-of-Design: Tandus Centiva, a Tarkett Company; www.tandus-centiva.com; LVT Tile + Plank.
- B. Tile Standard: ASTM F1700.
 1. Class: Class III, Printed Film Vinyl Tile.
 2. Type: B, Embossed Surface.
- C. Thickness: 0.120 inch.
 1. Wear Layer Thickness: 20 mil (0.5 mm).
- D. Edge Treatment: Square (SE).
- E. Size: 12 by 24 inches; 18 by 18 inches; 6 x 36 inches, 4 x 36 inches, 6 x 48 inches, depending on the style.
- F. Style: Venue Series (Venue Stone, Venue Abstract, and Venue Wood); Style as selected by Architect.
- G. Colors and Patterns: As selected by Architect from manufacturer's full selection.

2.3 VINYL COMPOSITION FLOOR TILE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Armstrong World Industries, Inc.; www.armstrong.com; Standard EXCELON® Tile Flooring.
 2. Mannington Mills, Inc.; www.mannington.com; Essentials or Progressions.
 3. Johnsonite; A Tarkett Company; www.johnsonite.com; Azrock TexTile™ VCT.
 4. Substitutions: Section 01 25 00 – Substitution Procedures.
- B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.
- C. Wearing Surface: Smooth.
- D. Thickness: 0.125 inch.
- E. Size: 12 inches by 12 inches.
- F. Colors and Patterns: As selected by Architect from manufacturer's full range of colors and patterns.

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile 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 floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Moisture vapor emission control treatment is specified in Section 09 05 61.13. All surfaces scheduled to receive resilient flooring shall receive moisture vapor emission control treatment.
- B. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- C. Concrete Substrates: Prepare 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 floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing on Top of Moisture Vapor Emission Control treatment: Perform tests recommended by floor tile 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 9 pH. An adhesive bond test must be performed using the actual flooring materials and adhesive to be installed. The test areas must be a minimum of 36" x 36" and remain in place for at least 72 hours and then evaluated for bond strength to the concrete.
 - 4. Moisture Testing:
 - a. Anhydrous Calcium Chloride Test: Not required. Confirm that moisture vapor emission control treatment has been successfully applied.
 - b. Relative Humidity Test: Not required. Confirm that moisture vapor emission control treatment has been successfully applied.
- D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- E. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.
- G. Do not begin installation until work of other trades in the area, including painting, has been completed.
- H. Apply concrete slab primer, if recommended by flooring manufacturer, before applying adhesive. Apply according to manufacturer's directions.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 1. Lay tiles square with room axis, unless otherwise indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 1. Lay tiles with grain running in one direction.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Lay tile when adhesive has set tacky, starting at the center of the room and working toward walls. Embed each tile in adhesive with closely fitted, straight, hairline joints. Do not cut tile except at walls or obstructions. Neatly scribe around pipes, fixtures, and equipment to form tight joints free of gaps. Finished floors shall be smooth and free from buckles, cracks, breaks, waves, and projecting edges and shall fit neatly at pipes and other installations and obstructions. Remove all excess adhesive.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile 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 floor tile surfaces before applying liquid floor polish.
 - 1. Apply two coat(s).
 - 2. Polish with mechanical buffer.
- E. For the entire period between installation of resilient flooring and acceptance of the Work by the Owner, protect floors from damage using methods recommended by the flooring manufacturer.

END OF SECTION

03/05/19

SECTION 09 65 43

LINOLEUM FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Resilient linoleum sheet flooring.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 02 41 19 – Selective Demolition; for removal of designated existing finish flooring.
 - 2. Section 09 05 61.13 – Moisture Vapor Emission Control.
 - 3. Section 09 65 13 – Resilient Base and Accessories.

1.2 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 00 for information concerning availability and use of references.
- B. ASTM International:
 - 1. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
 - 2. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
 - 3. ASTM E989 - Standard Classification for Determination of Impact Insulation Class (IIC).
 - 4. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
 - 5. ASTM F1869- Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 - 6. ASTM F2034 - Standard Specification for Linoleum Sheet Floor Covering.
 - 7. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
 - 8. ASTM F2659 - Standard Guide for Preliminary Evaluation of Comparative Moisture Condition of Concrete, Gypsum Cement and Other Floor Slabs and Screeds Using a Non-Destructive Electronic Moisture Meter.
 - 9. ASTM F3191 - Standard Practice for Field Determination of Substrate Water Absorption (Porosity) for Substrates to Receive Resilient Flooring.
- C. International Standards and Training Alliance (INSTALL):
 - 1. INSTALL Resilient Certification.
- D. Forbo Flooring Systems:
 - 1. Forbo Technical Data Sheets.
 - 2. Forbo Installation Guide.
 - 3. Forbo Floor Care Guide.

- E. General Services Administration Federal Specifications (Fed. Spec.)
- F. National Fire Protection Association (NFPA):
 - 1. NFPA 253 Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
 - 2. NFPA 258 Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

1.3 ACTION SUBMITTALS

- A. Product Data: Submit manufacturers product data for each type of resilient sheet flooring and accessory specified.
- B. Shop Drawings:
 - 1. Submit shop drawings showing layout, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 2. Show details of profiles and product components, including anchorage, accessories, finish colors, patterns and textures.
- C. Samples:
 - 1. Sheet Flooring: Submit minimum 6" x 9" samples of each different color and pattern of linoleum sheet flooring.
 - 2. Accessories: Submit 12-inch long samples of each different color and pattern of edge trim.
- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Manufacturer's Certification of Compliance: Certification of compliance: Letter of compliance signed by manufacturer certifying materials comply with specified performance characteristics and criteria, and physical requirements.
- C. Manufacturer's Installation Procedures: Submit a current copy of the flooring manufacturer's recommended standard installation procedure for each type of flooring material.

1.5 CLOSEOUT SUBMITTALS

- A. Manufacturer's Maintenance Instructions: Submit to the Owner, a current copy of the flooring manufacturer's printed recommendations for maintenance methods and products for each type of flooring material. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
- B. Submit three (3) copies of the warranty as specified herein.
- C. Installer Certification: Submit proof of certification from the manufacturer certifying that the installers comply with the specified requirements.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials to the Owner for repair purposes, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Include the cost of this material in the contract price. Select material from the same run number as the material installed. Identify materials as to location used.
 - 1. Sheet Flooring: Furnish not less than 50 square feet of linoleum sheet flooring, in roll form and in full roll width for each type, color, and pattern of sheet flooring installed.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements. The quantity of volatile organic compounds (VOC) used for flooring installation shall not exceed the limits permitted under the current regulations of the Bay Area Air Quality Management District.
- B. Requirements for Physically Disabled: Provide resilient flooring that is stable, firm, and meeting the slip resistant requirements of 0.5 minimum in accordance with ASTM D2047, the 2016 California Building Code (CBC) Title 24 Part 2; and 2010 ADA Standards for Accessible Design.
- C. Standard of Quality Mock-Ups: For the purpose of evaluating the quality of workmanship, install a mock-up of the specified flooring completed by the pre-qualified installers following the manufacturer's installation recommendations. Obtain Owner's and Architect's acceptance of finish color, texture and pattern, and workmanship standard. Comply with requirements according to the "Quality Control" in Division 1 Quality Requirements (Mock-Up Requirements) Section.
 - 1. Mock-Up Size: Minimum 10 feet x 10 feet.
 - 2. Location: As directed by Architect.
 - 3. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
 - 4. Incorporation: Mock-up may be incorporated into final construction upon Owner's approval.
- D. Pre-Installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements. Comply with Section 01 31 16 "Coordination and Project Meetings".
- E. Pre-Installation Testing: Conduct and document pre-installation testing (over the moisture vapor emission control treatment and cement topcoat applied by Section 09 05 61.13), as specified by manufacturer in accordance with the latest version of the specified test methods.
 - 1. Substrate Porosity Testing: ASTM F 3191 – Standard Practice for Field Determination of Substrate Water Absorption (Porosity) for Substrates to Receive Resilient Flooring.
 - 2. pH testing: ASTM F 710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
 - 3. In-situ Relative Humidity Testing: ASTM F 2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes. Not required. Confirm that Moisture Vapor Emission Control treatment and cement topcoat has been successfully applied per Section 09 05 61.13.
 - 4. Calcium Chloride Testing: ASTM F 1869 – Standard Test Method for Measuring Moisture Vapor Emissions Rate of Concrete Subfloor Using Anhydrous Calcium Chloride. Not required. Confirm that Moisture Vapor Emission Control treatment and cement topcoat has been successfully applied per Section 09 05 61.13.
 - 5. Surface Moisture Testing: ASTM F 2659 – Standard Guide for Preliminary Evaluation of Comparative Moisture Condition of Concrete, Gypsum Cement and other Floor Slabs and Screeds Using a Non- Destructive Electronic Moisture Meter.

6. Bond Testing: Conduct testing and document results in accordance with the manufacturer's recommendations.
- H. Post-Installation Meetings: Conduct post-installation meeting to review methods and procedures related to floor care and warranty requirements.

1.8 QUALIFICATIONS

- A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
 1. Engage installers certified by Forbo as a "Forbo Certified Sheet Technician."
 2. Proof of valid certification must be submitted to the General Contractor and Architect, and verified by Forbo prior to the start of the project.
 3. Forbo Certified Sheet Technicians must be present on the jobsite daily during installation.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Ordering: Comply with the manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Delivery: Deliver materials to the site in the manufacturer's original unopened containers clearly labeled with manufacturer's name, brand designation and production run number.
- C. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
 1. All materials (flooring, adhesives, weld rod and accessories) should be stored in areas that are fully enclosed and weathertight. The permanent HVAC should be fully operational and controlled and set at a minimum temperature 65 degrees F . If this is not possible, the areas should be acclimated and controlled by means of temporary HVAC to the service level conditions expected during occupancy. The temperature and humidity should range from 75 degrees F \pm 10 degrees F with a 50% \pm 10% ambient relative humidity.
 2. Store rolls standing upright, labels up, and ensure that the color, roll and batch numbers can be easily read.
 3. Comply with the manufacturer's recommendation for the acclimation of all materials in the space where they will be installed for at least 48 hours prior to the installation unless longer conditioning periods are required by the manufacturer.

1.10 PROJECT CONDITIONS

- A. Environmental Requirements/Conditions:
 1. Areas to receive material should be clean, fully enclosed and weather tight. The permanent HVAC should be fully operational and controlled and set at a minimum temperature 65 degrees F. If this is not possible, the areas should be acclimated and controlled by means of temporary HVAC to the service level conditions expected during occupancy. The temperature and humidity should range from 75 degrees F \pm 10 degrees F with a 50% \pm 10% ambient relative humidity. These conditions MUST be established at least seven days prior to beginning the installation, maintained during the installation, and continued for at least seven days following the installation.
 2. The flooring material should be conditioned in the same manner for at least 48 hours prior to the installation.

3. Substrate evaluation and preparation should not begin until a stable, conditioned environment has been established as described in this section.
 4. Areas to receive flooring must have adequate lighting to allow for proper inspection and preparation of the substrate, installation of the flooring and final inspection.
- B. Temperature Requirements: Maintain air temperature in spaces where products will be installed for time period before, during, and after installation as recommended by manufacturer.
1. Temperature Conditions: 65 degrees F for at least seven days prior to beginning the installation, maintained during the installation, and continued for at least seven days following the installation.
- C. Substrate Conditions:
1. Existing Conditions: Confirm that moisture vapor emission control treatment and cement topcoat specified in Section 09 05 61.13 have been installed.
 2. Pre-Installation Testing: Conduct and document pre-installation testing as specified by manufacturer, per paragraph 1.8.E above.
 3. Close spaces to traffic during flooring installation and for time period after installation recommended in writing by the manufacturer.
 4. Installation should not begin until the work of all other trades has been completed, especially overhead trades.
 5. Provide adequate ventilation to remove moisture and fumes from the area.
- D. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.11 SEQUENCING AND SCHEDULING

- A. Finishing Operations: Install flooring after finishing operations, including painting and ceiling operations, have been completed.
- B. Concrete Curing: Do not install flooring over concrete substrates until substrates have cured and are dry to bond with adhesive as determined by resilient flooring manufacturer's recommended bond, moisture test, and pH test.
1. Flooring Contractor assigned to report responsibility back to Owner/Architect.

1.12 WARRANTY

- A. Project Warranty: Refer to Section 01 78 36 "Warranties" for project warranty provisions.
- B. Manufacturer's Warranty: Submit the manufacturer's standard warranty document executed by authorized company official for Owner's acceptance. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
1. Warranty Period: Thirty (30) year limited warranty commencing on Date of Substantial Completion.
- C. Installation Warranty: Submit the flooring contractor's installation warranty signed by the General Contractor and Installer for Owner's Acceptance, agreeing to repair or replace work which has failed as a result of defects in workmanship. Failure shall include, but not limited to, tearing, cracking, separation, deterioration or loosening from substrate, seam failure, ripples, bubbling or puckering. Upon notification of such installation deficiencies, within the warranty period, make necessary repairs or replacement at the convenience of the Owner. Other guaranties or warranties may not be substituted by the Contractor for the terms of this

warranty. Installation warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents

1. Warranty Period: Two (2) year limited warranty commencing on Date of Substantial Completion from flooring contractor.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Provide resilient linoleum sheet flooring with the following fire performance characteristics as determined by testing products in accordance with ASTM method indicated below by a certified testing laboratory or another testing and inspecting agency acceptable to authorities having jurisdiction:
 1. Critical Radiant Flux: Class 1 Rating per NFPA 253 (ASTM E 648) (0.45 watts/cm² or greater).
 2. Smoke Density: Less than 450 per NFPA 258 (ASTM E 662).
- B. Flooring shall have a coefficient of friction equal to, or greater than, 0.5 in accordance with ASTM D2047.

2.2 LINOLEUM SHEET FLOORING

- A. Manufacturers:
 1. Forbo Flooring Inc.; www.forboflooringNA.com
 2. Armstrong World Industries, Inc.; www.armstrong.com/commercialflooring
 3. Substitutions: Section 01 25 00 "Substitution Procedures."
- B. Product Description and Basis-of-Design: Marmoleum® Real Linoleum Sheet.
 1. Linoleum Sheet Flooring: ASTM F2034, Type I, linoleum sheet with backing.
 2. Description: Homogeneous sheet linoleum of primarily natural materials consisting of linseed oil, wood flour, and rosin binders, mixed and calendered onto natural jute backing with an applied polyolefin comfort layer. Pattern and color shall extend throughout total thickness of material.
 3. Roll Width: 2 Meters (79").
 4. Roll Length: 32 Meters (105 Linear Feet).
 5. Gauge: 2.5mm (1/10 inch).
 6. Backing: Jute.
 7. Pattern and Colors: As selected by Architect from manufacturer's full product lines (including premium colors).
 8. Adhesive: Forbo Flooring, Inc., L 885 Adhesive.
 9. Net Fit Seams: Marmoleum® sheet products shall be installed utilizing net fit seams.
 10. Finish: Topshield2™ finish applied during the manufacturing process.

2.3 ACCESSORIES

- A. Adhesives and Primers: Products specified or recommended by the manufacturer of the particular resilient flooring furnished. Provide cutback type adhesives where required by manufacturer of flooring.
 1. Forbo L 885 Adhesive; or alternate Forbo Adhesive as dictated by field conditions.

- B. Floor Patch and Leveling Compound: Products manufactured specifically for the purpose as recommended by the manufacturer of the particular resilient flooring furnished.
 - 1. Where floors require extensive leveling or repair necessitating several thicknesses of leveling compound, use one of the following products or equal:

Industrial Products, Inc.; Vi-Tex Leveling Compound.
Armstrong Floor Div.; Underlayment S-183.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before installing resilient flooring, or other accessories, examine substrates to ensure that they are dry, clean of paint spots, oil, grease, wax, bond-breaking or curing compounds, and other materials whose presence would interfere with bonding of adhesive.
- B. Subsurface shall also be free from trowel marks, pits, dents, or other unusual roughness and sharp edges that would cause protrusions and bulges after resilient material is laid.
- C. Examination shall include verification that moisture vapor emission control coating and cement topcoat have been successfully applied to concrete subfloors, per Section 09 05 61.13, to ensure they are acceptable for product installation in accordance with manufacturer's instructions.
- D. Correct defective surfaces or conditions preventing proper execution of the work.
- E. Starting of work without such correction will be considered acceptance by the Contractor of the surface involved.
- F. Material Inspection: In accordance with manufacturer's installation requirements, visually inspect materials prior to installation. Material with visual defects shall not be installed and shall not be considered as a legitimate claim.

3.2 SURFACE PREPARATION

- A. Moisture vapor emission control treatment is specified in Section 09 05 61.13. All surfaces scheduled to receive resilient flooring shall receive concrete vapor control treatment and cement topcoat floor prep.
- B. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.
- C. Surface Preparation:
 - 1. General: Prepare substrate in accordance with manufacturer's recommendations and ASTM industry standards. Work shall not proceed until all unsatisfactory conditions are corrected to acceptable conditions to the Owner and Architect.
 - 2. Substrate: Substrates to receive flooring must be structurally sound, rigid, smooth, flat, clean, and permanently dry. The substrates must be free of all foreign materials including, but not limited to, dust, solvent, paint, wax, oils, grease, residual adhesive, adhesive removers, film-forming curing compounds, silicate penetrating curing compounds, sealing, hardening or parting compounds, alkaline salts, excessive carbonation or laitance, mold, mildew, and other foreign materials that might affect the rate of moisture dissipation from the concrete, the adhesion of flooring to the concrete or cause a discoloration of the flooring from below.

3. Concrete Substrate: Concrete substrates shall be cured per the concrete manufacturer's recommendations. They must have a minimum compressive strength of 3,000 psi and a minimum dry density of 150 pounds per cubic foot. Refer to paragraph 2.3.B above for patching, repairing crack materials and leveling compounds with Portland cement based compounds.
 - a. Reference Standard: Comply with the latest version of ASTM F 710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- B. Substrate Testing: In order to ensure that the moisture condition of concrete substrates is within acceptable limits, it is essential that moisture testing be conducted and documented on ALL concrete substrates regardless of age or grade level, including those where resilient flooring has already been installed. Moisture testing should only be conducted once a stable, conditioned environment has been established in accordance with the latest version of the specified test methods. All other testing types shall be conducted on all substrate types. A diagram of the area showing the location and results of each test should be submitted to the Architect, General Contractor and Owner. If at the time of testing the test results exceed the limitations set forth by the flooring manufacturer, the installation must not proceed until the problem has been corrected.
 1. In-situ Relative Humidity Testing: ASTM F 2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes. Not required. Confirm that moisture vapor emission control treatment and cement topcoat specified in Section 09 05 61.13 have been applied.
 2. Calcium Chloride Testing: ASTM F 1869 – Standard Test Method for Measuring Moisture Vapor Emissions Rate of Concrete Subfloor Using Anhydrous Calcium Chloride. Not required. Confirm that moisture vapor emission control treatment and cement topcoat specified in Section 09 05 61.13 have been applied.
 3. Substrate Porosity Testing: ASTM F 3191 – Standard Practice for Field Determination of Substrate Water Absorption (Porosity) for Substrates to Receive Resilient Flooring.
 - a. Conduct testing in accordance with the manufacturer's recommendations in various locations throughout the area where flooring is to be installed. Although the number of tests required may vary, enough tests should be performed to allow an evaluation of the entire area where material will be installed.
 - b. Water should penetrate into the substrate within 5 – 20 minutes to be considered acceptable. If water penetrates too rapidly or too slowly, adjustments to the substrate must be made to provide the proper surface profile. Substrates determined to be overly porous, dusty or generally insufficient may need to be primed using a primer according to the manufacturer's recommendations to regulate the porosity level of the substrate.
 4. pH testing: ASTM F 710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
 - a. Conduct testing at each calcium chloride test location as the calcium chloride tests are removed.
 - b. The surface pH of the concrete must not exceed a pH of 10.0 when using Forbo L 885 adhesive. Concrete surfaces with pH readings less than 7.0 or above 10.0 will require remediation prior to installation.
 5. Bond Testing:
 - a. Conduct testing in accordance with the manufacturer's recommendations in various locations throughout the area where flooring is to be installed. Although the number of tests required may vary, enough tests should be performed to allow an evaluation of the entire area where material will be installed.
 - b. When evaluating adhesive mat bond tests using Forbo L 885 adhesive, significant force should be required to remove the test sample. The bond failure should occur within the adhesive layer when the test sample is removed. There should be approximately the same amount of adhesive on the substrate and the material backing.

- C. Leveling Concrete Slabs: Use leveling and patching compounds as recommended by the resilient flooring manufacturer, for filling cracks, holes, and depressions in the subfloor to within specified tolerances and criteria.
 - 1. Provide up to 3 skim coats of floor leveling compound over the entire area to receive resilient flooring in order to provide a flat, smooth, rigid, level, permanently dry and clean surface free of foreign materials.
- D. Fill minor joints, cracks, or depressions in concrete slabs and subfloors with floor patch. Where floors require extensive leveling or repair necessitating several thicknesses, use leveling compound. Allow 24 hours drying time for leveling compound before applying resilient flooring.
- E. Do not begin installation until work of other trades in the area, including painting, has been completed.
- F. Apply concrete slab primer, if recommended by flooring manufacturer, before applying adhesive. Apply according to manufacturer's directions.

3.3 INSTALLATION

- A. General: Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.
- B. Material Installation: Measure the area to be installed and determine the direction in which the material will be installed and seam placement. Seams should be a minimum of 6" away from underlayment and concrete joints, saw cuts, etc. Cut the required length for the first sheet off of the roll, adding approximately 3" - 6" for extra trimming. Fit the first sheet along the main (long) wall and at the ends using standard fitting methods. Position the fitted sheet in place against the main wall. The factory edge must be trimmed in order to produce a clean edge suitable for seaming.
 - 1. The Forbo Seam & Strip Cutter has been developed to efficiently and effectively trim the factory edge. In lieu of the Forbo Seam & Strip Cutter, a straight edge, utility knife and hooked blade knife may also be used.
 - 2. Position the straight edge approximately 1/2" - 3/4" from the factory edge and score the material using the utility knife along the straight edge. After scoring, complete the cut using a hooked blade knife following the score line.
 - 3. Hold the blade at a slight angle to the surface of the material so the seam edge will have a slight undercut.
 - 4. After trimming the seam edge, draw a pencil line on the substrate lengthwise along the trimmed edge. This line will serve as a spread line when applying the adhesive.
 - 5. Do not reverse the sheets.
 - 6. Install all Marmoleum® sheets in the same direction.
 - 7. Immediately roll the flooring in all directions using a 100 lb. roller to ensure proper adhesive transfer. Additional rolling is required during adhesive setup to ensure that the material is flat and fully adhered. The use of a three-section wall roller or steel seam roller is required at walls, under toe kicks or anywhere the full weight of a 100 lb. roller cannot access or be applied.
- C. Adhesive Application: Use trowel recommended by flooring manufacturer for Forbo L 885 adhesive.
 - 1. 1/16" x 1/16" x 1/16" square notch trowel.
 - 2. Spread rate is approximately 125 ft²/gallon.
- D. Seaming: Install Marmoleum® sheet products utilizing net fit seams. A properly executed net fit seam will have no gaps or fullness. If the material is cut too full, it will result in bubbled

or peaked seams. Gaps will allow dirt or contaminants to accumulate. Cut the material at an angle so as to slightly undercut the material. This will compensate for any slight expansion that may occur. Roll the seam with a steel seam roller, making sure that the flooring material is placed into wet adhesive.

C. Installation Techniques:

1. Where demountable partitions and other items are indicated for installation on top of finished flooring, install flooring before these items are installed.
2. Scribe, cut, fit flooring to butt tightly to vertical surfaces, permanent fixtures and built-in furniture, including pipes, outlets, edgings, thresholds, nosings, and cabinets.
3. Extend flooring into toe spaces, door reveals, closets, and similar openings.
4. Install flooring on covers for telephone and electrical ducts, and similar items occurring within finish floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers.
5. Do not install resilient flooring over expansion joints. Use expansion joint covers manufactured for use with resilient flooring. Refer to other specification sections for expansion joint covers.
6. Adhere resilient flooring to substrate without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed installation.
 - a. Use adhesive applied to the substrate in compliance with the flooring manufacturer's recommendations, including those for proper spreading of the adhesive, adhesive missing and adhesive open and working times.
7. Immediately roll the flooring in all directions using a 100 lb. roller to ensure proper adhesive transfer. Additional rolling is required during adhesive setup to ensure that the material is flat and fully adhered. The use of a three-section wall roller or steel seam roller is required at walls, under toe kicks or anywhere the full weight of a 100 lb. roller cannot access or be applied.

3.4 MANUFACTURER'S FIELD SERVICES

- A. Upon Architect's request and with at least 72 hours notice, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.
1. Site Visits: Minimum one site visit of 1 - 2 hours duration.

3.5 PROTECTION

- A. Protection: Do not allow heavy traffic or rolling loads for at least 72 hours following the installation. Additional time may be necessary if the installation is over a non-porous substrate. Protect installed product and finish surfaces from damage during construction. Remove and legally dispose of protective covering at time of Substantial Completion.

3.6 CLEANING

- A. Initial Maintenance: In order to allow the adhesive to dry and cure properly, wait a minimum of five days following the installation before conducting wet cleaning procedures or initial maintenance. Additional time may be necessary if the installation is over a non-porous substrate.
- B. Procedure:
1. Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's

- recommendations prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.
2. Remove visible adhesive and other surface blemishes using cleaning methods recommended by floor manufacturer.
 3. Marmoleum® with Topshield 2™ is pre-sealed and pre-finished. It is occupancy ready and no additional finish is required at the time of installation. See manufacturers' recommendations for further information.
 4. Remove all surface soil, debris, sand and grit by dust mopping, sweeping or vacuuming the floor.
 5. Mix a neutral pH cleaning solution according to the label directions and apply the solution to the floor. Do NOT flood the floor. Allow the solution to dwell on the floor for 5 – 10 minutes.
 6. Scrub the floor using a 3M™ Red Buffer Pad #5100 or equivalent.
 7. Pick up the scrubbing solution with a wet vacuum or an automatic scrubber.
 8. Rinse the entire floor surface with a clean mop using clean, cool water.
 9. Allow the floor to dry thoroughly before allowing traffic.

3.7 INITIAL MAINTENANCE PROCEDURES

- A. General: Include in Contract Sum Amount cost for initial maintenance procedures, and execute procedures after flooring installation as recommended by flooring manufacturer.
- B. Initial maintenance "Starter Kit" supplied by manufacturer. Initial maintenance to be conducted by flooring contractor.
- C. Drying Room Yellowing/Ambering: Marmoleum® products are made from natural materials. During the manufacturing process while the material is maturing in the drying room stoves, the natural occurrence of a yellow cast, termed "drying room yellowing" or "ambering" appears on the surface. This yellow cast is caused by the oxidation of linseed oil, occurring intermittently and with varying intensity. It is most noticeable on light blues, greys and soft ivory shades of material. The yellow cast is only TEMPORARY. The yellow cast is most noticeable when a new roll or carton of material is opened. It can appear as being off shade from the sample materials. When the material is exposed to light, the yellow cast will dissipate. The process may take as little as a few hours in bright sunlight or longer with artificial light. Because this is a natural occurrence in the product, there is no set time frame for the yellowing to dissipate. This is not a material defect. Performing floor care procedures, such as applying floor finish to the material, will not prevent the dissipation but may slow the process.

END OF SECTION

03/05/19

SECTION 09 68 16

SHEET CARPETING

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Sheet Carpet.
 - 2. Installation.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
- C. Related Sections:
 - 1. Section 02 41 19 "Selective Demolition" for removing existing floor coverings.
 - 2. Section 09 05 61.13 "Moisture Vapor Emission Control."
 - 3. Section 09 65 13 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet.

1.02 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 00 for information concerning availability and use of references.
 - American Association of Textile Chemists and Colorists (AATCC)
 - American Society for Testing and Materials (ASTM International)
 - Carpet and Rug Institute (CRI)

1.03 ACTION SUBMITTALS

- A. Product Data:
 - 1. Provide data on specified products, describing physical and performance characteristics, sizes, patterns, and colors available.
 - 2. Include manufacturer's written installation recommendations for each type of substrate.
- B. Shop Drawings: For carpet installation, showing the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
 - 2. Carpet type, color, and dye lot.
 - 3. Seam locations, types, and methods.
 - 4. Type of subfloor.
 - 5. Type of installation.
 - 6. Pattern type, repeat size, location, direction, and starting point.
 - 7. Pile direction.
 - 8. Types, colors, and locations of insets and borders.
 - 9. Types, colors, and locations of edge, transition, and other accessory strips.

- 10. Transition details to other flooring materials.
- C. Carpet schedule using same room designations indicated on drawings.
- D. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial color selection.
- E. Verification Samples: Submit two 18" x 18" samples illustrating color and pattern for each carpet material specified.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranties: For special warranties.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet.

1.06 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. Provide additional 5% of each type, color, and pattern furnished; product to be rolled and bound. Coordinate storage location with owner.
- B. Deliver all unused carpet and large scraps to Owner for "attic stock." Dispose of scraps less than 2 square foot in area or less than 8" in width.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Company specializing in manufacturing specified carpet/backing with minimum 5 years documented experience.
 - 2. Upon request, manufacturer to provide representative to assist in project start-up and to inspect installation while in process and upon completion. Representative will notify designated contact if any installation instructions are not followed.
 - 3. Single Source Responsibility: Obtain each type of carpet from one source and by a single manufacturer.

B. Installer Qualifications:

1. Flooring contractor must be certified by the carpet manufacturer prior to bid.
2. Flooring contractor to be a specialty contractor normally engaged in this type of work and shall have prior experience in the installation of these types of materials.
3. Certify payment of Prevailing Wage Rates to the installers.
4. Flooring contractor possessing Contract for the carpet installation shall not sub-contract the labor without written approval of the Project Manager.
5. Flooring contractor will be responsible for proper product installation, including floor testing and preparation as specified by the carpet manufacturer and JOB CONDITIONS Article specified herein.
6. Flooring contractor to provide Owner a written installation warranty that guarantees the completed installation to be free from defects in materials and workmanship for a period of one year after job completion.
7. Flooring contractor to provide Owner a written recycling warranty that guarantees the old carpet to be 100% recycled and the Flooring contractor will provide a certificate of recycling to the Owner in close-out documents.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Comply with the Carpet and Rug Institute's CRI 104.
- B. Deliver materials to the site in manufacturer's original packaging listing manufacturer's name, product name, identification number, and related information.
- C. Store in a dry location, between 60 degrees F and 80 degrees F and a relative humidity below 65%. Protect from damage and soiling. Stack carpet rolls horizontally on a flat surface, stacked no higher than two rolls.
- D. Make stored materials available for inspection by the Owner's representative.
- E. Store materials in area of installation for minimum period of 48 hours prior to installation.

1.09 FIELD CONDITIONS

- A. Comply with the Carpet and Rug Institute's CRI 104 for temperature, humidity, and ventilation limitations.
- B. Sub-floor preparation is to include all required work to prepare the existing floor for installation of the product as specified in this document and Manufacturer's installation instructions.
- C. All material used in sub-floor preparation and repair shall be recommended by the carpet manufacturer and shall be chemically and physically compatible with the carpet system being bid.
- D. Maintain minimum 65 degrees F ambient temperature and 65% Relative Humidity for 72 hours prior to, during, and 48 hours after installation.

- E. Environmental Limitations: Do not install carpet until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

1.10 WARRANTY

- A. Warranty to be sole source responsibility of the Manufacturer. Second source warranties and warranties that involve parties other than the carpet manufacturer are unacceptable.
- B. If the product fails to perform as warranted when properly installed and maintained, the affected area will be repaired or replaced at the discretion of the Manufacturer.
- C. Chair Pads are not required for carpet warranty coverage.
- D. Warranty shall be for a minimum non-prorated period of twenty-five years and shall cover against:
 - 1. Excessive Surface Wear: More than 15% loss of pile fiber weight.
 - 2. Excessive Static Electricity: More than 3.0 kV per AATCC 134.
 - 3. Resiliency Loss of the Backing: More than 10% loss of backing resiliency.
 - 4. Delamination.
 - 5. Edge Ravel.
 - 6. Zippering.
- E. Tuft Bind warranty in lieu of edge ravel and zippering is not acceptable.

PART 2 – PRODUCTS

2.01 FIBER

- A. Nylon Fiber: Bulked Continuous Filament Nylon.
- B. Blends of Solutia fibers are not allowed. Solutia LXI fibers alone are not allowed.
- C. Durable stain inhibitor should be applied to the fiber during product manufacturing to resist fiber staining and soiling. Minimum average of three fluorine analyses of a single composite sample per CRI TM-102: 500 ppm.
- D. Fiber to contain carbon-core filament for permanent static control. Topical treatments not allowed.

2.02 BACKING CHARACTERISTICS

- A. Thermoplastic vinyl composite.
- B. Primary Backing: Synthetic Non-Woven.
- C. Pre-Coat (Fusion Coat): Sealant Vinyl
- D. Secondary Backing: Closed-Cell, Vinyl Cushion backing system.

1. Density (ASTM D-1667): 18.5 lbs/cu ft +/- 5%.
 2. Compression Set (ASTM D-1667): Max 10%.
 3. Compression Deflection (ASTM D-1667): Min. 7 psi @ 25%; Max. 25 psi @ 25%.
 4. Impermeable to moisture and airflow.
 5. Provide for a chemically welded seam that is also impermeable to moisture and airflow.
 6. 6' Width Roll Goods.
- E. Product to be installed with a mill-applied releasable "dry" adhesive system to securely attach product to sub-floor in compliance with ADA guidelines (Section 4.5.3) if available from Manufacturer. Free-lay, grid system, and stretch-in installations not allowed.
- F. Product to provide asbestos enclosure properties. Enclosure means an airtight, impermeable, permanent barrier around ACBM (Asbestos Containing Building Material) to prevent the release of asbestos fibers into the air.

2.03 RECYCLING PROGRAM

- A. Manufacturer must have a collection and recovery system for product and a fully established, currently operational recycling program at time of bid per FTC guides Section 260.7 (d).
- B. Manufacturer must be able to reclaim and recycle 100% of existing carpet of similar composition back into carpet at time of bid.
- C. Manufacturer must have product a take back program and be able to reclaim and recycle 100% of installed product back into carpet at the end of its service life at time of bid. Claiming a product is recyclable based on future expectation of technology, equipment, process or availability of that product as feed stock is not acceptable. Recycling process must be available for viewing.
- D. Collection and recycling program must be verified by an independent, neutral third-party organization, such as Scientific Certification Systems.
- E. Manufacturer must have written guarantee that 100% of the recovered product will be recycled and that no portion of the product will be landfilled or incinerated (including waste-to-energy).

2.04 ENVIRONMENTALLY PREFERABLE PRODUCT

- A. Carpet must be certified as an Environmentally Preferable Product (EPP) by a neutral, independent, third party organization such as Scientific Certification Systems. Carpets must carry an EPP carpet label certifying its Environmental Preferability. Products carrying EPP carpet labels will be given higher preference than those carrying only an EPP fiber label.

2.05 INDOOR AIR QUALITY

- A. Product must have low VOC, factory applied, "dry" adhesive.
- B. Product, inclusive of floor covering adhesive, must meet CRI's IAQ requirements for carpet only. Environmental chamber testing per ASTM D-5116. Emission Rates determined at 24 hours. Product, inclusive of pre-applied adhesive must off gas less than:
- 0.5 mg/sq. meter per hour of Total Volatile Organic Compound (TVOC);
 - 0.05 mg/sq. meter per hour of formaldehyde;
 - 0.4 mg/sq. meter per hour of styrene; and

- 0.05 mg/sq. meter per hour of 4-Phenyl Cyclohexene (4-PC)
- 1. Submit Indoor Air Quality report showing CRI Green label Certification Number for carpet (inclusive of adhesive). [If results for carpet testing are not inclusive of adhesive, submit separate IAQ test reports for carpet and adhesive].
- 2. Indoor air quality results of the product installed must be same as those specified by the Project requirements.
- 3. Additionally, product, inclusive of adhesive, must meet the requirements of the State of Washington Indoor Air Quality Specifications for Carpet at 24 hours. Environmental chamber testing per ASTM D-5116. Product must not require the 30-day air out period that the State of Washington protocol allows.

2.06 PERFORMANCE CHARACTERISTICS

- A. Test reports for the following performance assurance testing to be submitted upon request. Submitted results shall represent average results for production goods of the referenced style.
- B. Requirements listed below must be met by all products.
 - 1. Flooring Radiant Panel:
ASTM E-648 / NFPA 253: Class 1 (CRF: 0.45 watts/sq cm or greater)
 - 2. Federal Flammability:
CPSC FF 1-70: Passes
 - 3. Smoke Density:
ASTM E-662 / NFPA 258: < 450 Flaming Mode
 - 4. Electrostatic Propensity:
AATCC 134 (Step & Scuff): 3.0 kV or less
 - 5. Static Coefficient of Friction:
ASTM C-1028: Passes ADA Guidelines for Accessible Routes (Minimum 0.60)
 - 6. Delamination of Secondary Backing of Pile Floor Coverings:
ASTM D-3936: No Delamination
 - 7. Lightfastness:
AATCC 16E: > 4 @ 100 hours
 - 8. Vetterman Drum:
ASTM D-5417: Minimum 3 @ 22,000 cycles
 - 9. Moisture Barrier:
Moisture Penetration by Impact @ 10 psi: No Penetration of backing and seam after 10,000 impacts
 - 10. Air Flow Barrier:
Air Permeability of Textile Fabrics: No Air Flow (0.0 ft³/min) through backing and seam
 - 11. Seam Integrity:
Seam to remain intact after 50,000 cycles per Phillips Chair Test
 - 12. VOC Chamber Testing:

ASTM D-5116: Product inclusive of “dry” adhesive system meets criteria established by the State of Washington Indoor Air Quality Specification for Carpet and/or Carpet & Rug Institute’s (CRI) Indoor Air Quality Carpet Testing Program. If “dry” adhesive (2.02E) not available from manufacturer and “wet”

2.07 MANUFACTURING SPECIFICATIONS

- A. Basis-of-Design Products: Subject to requirements, provide products as specified in paragraph 2.07.B and paragraph 2.07.C.
- B. Manufactured by Tandus Flooring; www.tandus-centiva.com
Style: **Aftermath II** Powerbond Cushion RS (Drawing Designation CPT-1).

Color:	TBD
Construction:	Loop
Gauge:	5/64"
Pile Units per Inch:	8.5
Pile Height Average:	0.187"
Tuft Density:	108.8
Fiber System:	90% Dynex SDN 10% Dynex Nylon with Static Control and Ensure
Powerbond Backing System:	6 ft
Fusion Coat:	Sealant Vinyl
Backing:	Closed cell vinyl cushion
Weight:	35.5 oz/sq yd
Density:	18.5 lbs/cu ft
Thickness:	0.156"
Total Weight:	81.0 oz/sq yd +/- 5%
Compression Set:	Max 10%
Compression Deflection:	7 min. 25 max. lbs/sq inch @ 25%
Electrostatic Propensity:	1.4 K.V. or lower
Flooring Radiant Panel Test:	Mean average critical radiant flux: 0.45 w/sq cm or higher
Smoke Density:	Flaming: Mean average: 450 or lower
Flammability:	Passes
NSF 140:	Gold
CRI Green Label Plus Certification:	GLP9744
Warranties:	Lifetime wear, delamination, edge ravel, static, zippering, loss of resiliency

- C. Manufactured by Tandus Flooring; www.tandus-centiva.com
Style: **Abrasive Action** Powerbond Cushion RS (Walk-Off System, drawing designation CPT-MAT).

Color:	TBD
Construction:	Accuweave Patterned Loop
Gauge:	1/12"
Pile Units per Inch:	8.0
Pile Height Average:	0.187"
Density Factor:	7,513
Fiber System:	100% TDX SDN Nylon
Powerbond Backing System:	6 ft
Fusion Coat:	Sealant Vinyl
Backing:	Closed cell vinyl cushion
Weight:	35.5 oz/sq yd

Density:	18.5 lbs/cu ft
Thickness:	0.156"
Total Weight:	81.0 oz/sq yd +/- 5%
Compression Set:	Max 10%
Compression Deflection:	7 min. 25 max. lbs/sq inch @ 25%
Flooring Radiant Panel Test:	Mean average critical radiant flux: 0.45 w/sq cm or higher
Smoke Density:	Flaming: Mean average: 450 or lower
Flammability:	Passes

- D. Substitutions: Not permitted.

2.08 INSTALLATION ACCESSORIES

- A. Materials recommended by Manufacturer for patching, priming, chemically welding the seams, etc.
- B. Adhesives: Products to be supplied with a pre-cured, mill-applied or other "dry" adhesive system (2.02E) when available. Otherwise, adhesive should be full spread, extremely low VOC in compliance with CRI Indoor Air Quality Adhesive Testing Program requirements, compatible with materials being adhered, as recommended by the Manufacturer.
- C. Base, Carpet Edge, and Transition Strips: As specified in Section 09 65 13.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance.
- B. Examine carpet for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that moisture emission control treatment specified in Section 09 05 61.13 has been successfully applied to existing concrete slabs, and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
1. Moisture Testing:
 - a. Anhydrous Calcium Chloride Test: Not required. Confirm that moisture emission control treatment specified in Section 09 05 61.13 has been successfully applied to existing concrete slabs.
 - b. Relative Humidity Test: Not required. Confirm that moisture emission control treatment specified in Section 09 05 61.13 has been successfully applied to existing concrete slabs.
 - c. Perform additional bond tests recommended in writing by adhesive and carpet manufacturers. Proceed with installation only after substrates pass testing.
- D. Sheet carpeting tile shall be stable, firm and slip resistant.

3.02 PREPARATION

- A. General: Comply with the Carpet and Rug Institute's CRI 104 and with carpet manufacturer's written installation instructions for preparing substrates.

- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.
- C. Prepare sub-floor to comply with criteria established in Manufacturer's installation instructions. Use only preparation materials that are acceptable to the Manufacturer.
 - 1. Remove all deleterious substances from substrate(s) that would interfere with or be harmful to the installation. (e.g. floor wax).
 - 2. Remove sub-floor ridges and bumps. Fill cracks, joints, holes, and other defects.
- D. Verify that sub-floor is smooth and flat within specified tolerances and ready to receive carpet.
- E. Verify that substrate surface is dust-free and free of substances that would impair bonding of product to the floor.
- F. Verify that concrete surfaces are ready for installation and are within the limits recommended by Manufacturer.
- G. Broom and vacuum clean substrates to be covered immediately before installing carpet.
- H. There will be no exceptions to the provisions stated in the Manufacturer's installation instructions.

3.03 INSTALLATION

- A. Comply with the Carpet and Rug Institute's CRI 104 and carpet manufacturer's written installation instructions for the following:
 - 1. Direct-glue-down installation using mill-applied releasable "dry" adhesive system.
- B. Verify carpet match before cutting to ensure minimal variation between dye lots.
- C. Layout carpet and locate seams in accordance with shop drawings.
 - 1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic. Minimize cross seams.
 - 2. Do not locate seams perpendicular through door openings.
 - 3. Align run of pile in same direction on adjacent pieces.
 - 4. Locate change of color or pattern between rooms under door centerline.
 - 5. Provide monolithic color, pattern, and texture match within any one area.
 - 6. Check pattern repeat, if any, for matching during installation and possible waste factors in ordering required amounts.
- D. Install carpet tight and flat on sub-floor, well-fastened at edges, with a uniform appearance.
- E. Double-cut carpet seams with accurate pattern match. Make cuts straight, true, and unfrayed.
- F. Chemically weld all seams with manufacturer's recommended seam sealer as stated in installation instructions. Make sure the seam is fully sealed.
- G. Roll with appropriate roller for complete contact of carpet with mill-applied adhesive to sub-floor.

- H. Trim carpet neatly at walls and around interruptions.
- I. Completed carpet is to be smooth and free of bubbles, puckers, and other defects.
- J. Install resilient molding accessory (carpet to resilient flooring joiner) where carpet butts to adjacent resilient flooring.

3.04 CLEANING AND PROTECTION

- A. Remove excess adhesive and/or seam sealer from floor and wall surfaces without damage.
- B. Remove all rubbish, wrappings, debris, trimmings, etc. from site and dispose of properly.
- C. Clean and vacuum carpet surfaces using a beater brush/bar commercial vacuum.
- D. Protect installed carpet to comply with the Carpet and Rug Institute's CRI 104.
- E. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods recommended in writing by carpet manufacturer

END OF SECTION

03/05/19

SECTION 09 91 00

PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Furnishing of materials and equipment and completion of painting and painter's finish on exposed exterior and interior surfaces as required to complete the painting and finishing as indicated and specified.
- B. Related Documents: The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 DEFINITIONS

- A. Blocking: Two painted surfaces sticking together such as a painted door sticking to a painted jamb.
- B. PDCA: Painting & Decorating Contractors of America www.pdca.org.
- C. SSPC: Scopes of SSPC Surface Preparation Standards and Specifications. www.sspc.org.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples: Prepare samples of colors and textures based upon the Architect's selections and submit them for review.
 - 1. Painted Wall Samples: Prepare on 8" by 10" matt board in a stair step manner so all required coats show.
 - 2. Painted Wood Samples: Prepare on clear Douglas fir or pine 1" by 4" by 24" long strips, arranged in a stair step manner so all required coats show.
- C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.
- D. Submittal procedures and quantities are specified in Section 01 33 00.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
- B. Quantity: Furnish Owner with an additional 3 percent, but not less than one gallon of each material and color applied.

1.4 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.
- B. The intent and requirements of this section, is that materials, items and surfaces which are normally painted and finished in construction of this type and quality, shall be so included, whether or not said materials, items or surfaces are specifically called out and included in the schedules and notes on the drawings, or is, or is not, specifically mentioned in these specifications.
- C. The following general categories of construction and items are included under other sections, and shall not be a part of this section:
1. Shop prime painting of structural and miscellaneous iron or steel.
 2. Shop prime painting of hollow metal.
 3. Shop finished construction and items.
- D. Paint exposed mechanical, plumbing and electrical construction, which is not factory finished.
- E. The Room Finish Schedule indicates the location of interior room surfaces to be painted or finished. The schedule indications are general and do not necessarily define the detail requirements. Include detailed refinements and further instructions as may be given for the required complete finishing of spaces and rooms.
- F. Regulatory Requirements. The quantity of volatile organic compounds (VOC) used in paint products shall not exceed the limits permitted under the current regulations for architectural coatings of the Bay Area Air Quality Management District.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Delivery:
1. Deliver paint in manufacturer's labeled and sealed containers. Labels shall include manufacturer's name, brand, type, batch number, color of paint and instructions for reducing. Thin only in accordance with printed directions of manufacturer. Thinning shall comply with the regulations of the air pollution control district having jurisdiction.
 2. Do not deliver or use materials other than those specified, or approved.
- B. Storage and Handling: Store paint materials and equipment, when not in actual use, in places specifically assigned for that purpose. Ventilate storage space and provide fire protection.

Mix and handle paint in these assigned areas; use metal containers for mixing and handling and designed for safety. Remove paint materials, including rags, tarpaulins, mixers, and empty containers and filled or partially filled containers from the building areas at the close of each working day.

1.6 PROJECT CONDITIONS

A. Environmental Requirements:

1. Exterior Surfaces: Do not apply exterior paint in damp, rainy weather or until the surface has dried thoroughly from the effects of such weather. Do not apply transparent finishes or paint when temperature is below 50 degrees F. Avoid painting surfaces when exposed to hot sunlight.
2. Interior Surfaces: In enclosed spaces, perform the application and drying of paint only when the temperature is 65 degrees F or above and maintained constantly to prevent condensation.

B. Examine the drawings and the specifications of other trades and consult with the other trades to determine the full extent of surfaces and items that are specified to include shop priming and shop finish painting.

1.7 WARRANTY

A. Provide an extended warranty under the provisions of Section 01 78 36.

B. Warrant painting and finishing against peeling, fading, cracking, blistering, or crazing for a period of 2 years from the date of "Substantial Completion". The written warranty shall include materials and labor. The warranty shall be signed by the paint manufacturer, the painter and the Contractor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: Subject to compliance with requirements, provide products listed from one of the following manufacturers for the paint category indicated.

1. Benjamin Moore.
2. Dunn-Edwards Corp.
3. PPG Paints.
4. Kelley-Moore Paint Co.
5. Sherwin-Williams Co.

B. Primer and sealer coats may be thinned no more than 10 percent, with paint manufacturer's thinner. Use other materials as they come from the can, except as otherwise approved.

C. Secure the Color Schedule before undercoating. Unless otherwise specified, tint undercoats slightly to approximate the color of the finish coat. Obtain approval of colors before proceeding with the finishing operations.

D. Where a specific name is not given for a product or ingredient, provide item of the best quality of the approved manufacturer, which is normally used for the intended purpose.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Low-Emitting Materials: Interior paints and coatings 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. Colorants: The use of colorants containing hazardous chemicals, such as ethylene glycol, is prohibited.

2.3 COLOR SELECTION

A. The Architect will select the finish colors and determine the basic hues of all surfaces to be painted or finished.

B. Colors: Custom colors as selected by the Architect.

C. After the actual painting and finishing has started, the Architect retains the right to make minor modifications in tone and shade on the various surfaces to suit the actual lighting conditions encountered. Submit additional samples, as required, to assist the Architect in his final selection.

D. The number of colors to be used in any given room or space, and on the entire project, will be determined by the Architect.

2.4 MATERIALS

A. Substitutions: Materials will be considered for substitution subject to requirements specified in Section 01 25 00. Submit chemical formulations of materials proposed for substitution to demonstrate that formulation of substitution is similar to formulation of specified product; or results of test showing that performance of substitution is equivalent to performance of specified product.

B. Acceptable Products: Unless otherwise specified in the Paint Schedule, acceptable products include the following or equal:

1. Galvanized Metal Primer: Must remove Passivators

Benjamin-Moore; P04 Acrylic Metal Primer
Dunn-Edwards Corp.; UGPR00 Ultra-Grip
PPG PAINTS; 4020 Pitt Tech Plus (91 g/L VOC)
Kelly-Moore Paint Co.; 5725 DTM Acrylic Primer/Finish
Sherwin Williams Co.; B66 Pro Industrial Pro-Cryl Universal Acrylic Primer

2. Ferrous Metal Primer:

Benjamin-Moore; P04 Acrylic Metal Primer
Dunn-Edwards Corp.; BRPR00-1 Bloc-Rust
PPG PAINTS; 4020 Pitt Tech Plus (91 g/L VOC)

Kelly-Moore Paint Co.; 5725 DTM Acrylic Primer/Finish
Sherwin-Williams Co.; Pro Industrial ProCryl Universal Metal Primer B66-310

3. Organic Zinc Primer:

Carboline Corp.; Carbozinc 859 Series
PPG PAINTS: Amercoat 68HS VOC Zinc Rich Primer (84 g/L VOC)
Kelly-Moore Co.; Devoe Catha – Coat 302H
Sherwin-Williams Co.; Corothane I Galvapak Two Pack Zinc Primer 65G10/B69D210
Tnemec, Inc.; 90-96 Tneme-Zinc

4. Wood Primer - Exterior:

Benjamin-Moore; 166 Superspec Busan 100% Acrylic Exterior Primer
Dunn-Edwards Corp.; EZPR00 E-Z Prime
PPG Paints; 3210 Gripper (90.3 g/L VOC)
Kelly-Moore Paint Co.; 255 Acry-Shield Exterior Wood Primer
Sherwin-Williams Co.; Ext Latex Wood Primer B42W8041

5. Intermediate Metal Undercoat - Exterior:

Benjamin-Moore; P04 Acrylic Metal Primer
Dunn Edwards: N/A
PPG PAINTS; 4020 Pitt Tech Plus (91 g/L VOC)
Kelly-Moore Paint Co.; 5725 DTM Acrylic Primer Finish
Sherwin-Williams Co.; Pro Industrial ProCryl Universal Metal Primer B66-310

6. Acrylic Enamel Undercoat - Interior:

Benjamin-Moore; 253 Moorcraft Superspec Latex Enamel Undercoat
Dunn-Edwards Corp.; IKPR00 Interkote
PPG Paints; 1000 Prep & Prime Enamel Undercoater (92.6 g/L VOC)
Kelley-Moore Paint Co.; 973 Acry-Plex ZERO VOC Interior Wall Primer Undercoat
Sherwin-Williams Co.; ProMar 200 Zero VOC Primer B282600

7. Vinyl Acrylic Sealer:

Benjamin-Moore; 534 Ultra Spec 500 Interior Latex Primer
Dunn-Edwards Corp.; VNPR00 Vinylastic
PPG Paints; 1000 Hi Hide Interior Primer Sealer (92.6 g/L VOC)
Kelly-Moore Paint Co.; 971 Acry-Plex Low VOC Interior PVA Primer/Sealer
Sherwin-Williams Co.; Premium Wall & Wood Primer B28

8. Polyurethane Enamel:

Benjamin-Moore/Corotech; V540 Waterborne Urethane Gloss
Dunn-Edwards Corp.; Carbothane 133 Series Semi-Gloss or 134 Series Gloss
Carboline Corp.; D834
PPG Paints; Amershield VOC Urethane Gloss (84 g/L VOC)
Kelly-Moore Paint Co.; 971 Acry-Plex Low VOC Interior PVA Primer/Sealer
Sherwin-Williams Co.; Pro Industrial Waterbased Alkyd Urethane Enamel B53
Tnemec, Inc.; Endurashield IV
Valspar; 54 Series Urethane Enamel

9. Acrylic Gloss Enamel:

Benjamin-Moore; Ultra Spec EXT 449 Gloss Finish
Dunn-Edwards Corp.; EVERSHIELD, Gloss 100% Acrylic Paint (EVSH60)
PPG PAINTS; 3028N Ultra-Hide 250 Int/Ext Gloss Enamel (34 g/L VOC)

Kelly-Moore Paint Co.; Devcryn 1449 Waterborne Gloss
Sherwin-Williams Co.; A-100 Acrylic Gloss A8 Series

10. Wood Trim Enamel - Semi-Gloss:

Benjamin-Moore; 448 Ultra Spec EXT Satin Finish
Dunn-Edwards Corp.; EVSH50 Evershield Semi-Gloss / SSSL50 Spartashield
PPG PAINTS; 2406XI Fortis 350 Semi-Gloss (41.63 g/L VOC)
Kelly-Moore Paint Co.; 1215 Premium Professional Exterior 100% Acrylic Semi-Gloss
Sherwin-Williams Co.; A-100 Exterior Latex Gloss A8 Series

11. Acrylic Latex Enamel - Semi-Gloss - Interior:

Benjamin-Moore; 539 Ultra spec 500 Semi-Gloss
Dunn-Edwards Corp.; SPMA50 Suprema Semi-Gloss / SZRO50 SpartaZero
PPG PAINTS; 6-4510XI Speedhide Zero Semi-Gloss Enamel (Zero VOC)
Kelly-Moore Paint Co.; 1050 Premium Professional Semi-Gloss Enamel
Sherwin-Williams Co.; Pro Industrial Waterbased Alkyd Urethane Enamel B53

12. Acrylic Enamel-Non Blocking - Semi-Gloss - Interior:

Benjamin-Moore; EcoSpec W/B Semi Gloss 376
Dunn-Edwards Corp.; EVSH50 Evershield Semi-Gloss
PPG Paints; 1406N Ultra Hide-250 Non-Blocking Semi-Gloss (50 g/L VOC)
Kelley-Moore Paint Co.; 1650 Acry-Plex 100% Acrylic Interior Semi-Gloss Enamel
Sherwin-Williams Co.; Solo Semi Gloss A76W0051

- C. Primer and sealer coats may be thinned no more than 10 percent, with paint manufacturer's thinner. Use other materials as they come from the can, except as otherwise approved.
- D. Secure the Color Schedule before undercoating. Unless otherwise specified, tint undercoats slightly to approximate the color of the finish coat. Obtain approval of colors before proceeding with the finishing operations.
- E. Where a specific name is not given for a product or ingredient, provide item of the best quality of the approved manufacturer, which is normally used for the intended purpose.

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. Masonry (Clay and CMU): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Portland Cement Plaster: 12 percent.
 - 5. Gypsum Board: 12 percent.
- C. Portland Cement Plaster Substrates: Verify that plaster is fully cured, including pH testing to determine that alkalinity is within limits established by the manufacturer.
- D. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

- E. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates 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, including pH testing to determine that alkalinity is within limits established by the manufacturer.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed 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 1, "Solvent Cleaning."
 - 2. SSPC-SP 2, "Hand Tool Cleaning."
 - 3. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and 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 fabricated from coil stock 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 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. The number of coats scheduled is the minimum number of coats required. Additional coat(s) shall be applied at no additional cost to the Owner, to completely hide base material, provide uniform color, and to produce satisfactory finish results.
 - 3. Apply coatings without thinning except as specifically required by label directions, or required by these specifications. In such cases, thinning shall be the minimum reduction permitted.
 - 4. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 - 5. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 - 6. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 7. Priming may not be required on items delivered with prime or shop coats, unless otherwise specified. Touch up prime coats applied by others as required ensuring an even primed surface before applying finish coat.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. 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. Block Fillers: Provide block fill as scheduled to conform to the following: PDCA Standard P12-05.
 - 1. Level 3 - Premium fill: One or multiple coats of high performance block filler manufactured to be applied at a high dry film build. Block filler shall be back-rolled to eliminate voids and reduce the majority of the masonry profile depth.
- F. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed to view:
 - 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.

3.4 CLEANING, TOUCH-UP AND REFINISHING

- A. Touch-Up and Refinishing: Touch up, refinish, or repaint runs, sags, misses, holidays, stains and other defects in the painted surfaces, including inadequate coverage and mil thickness as necessary to produce a first-class workmanlike job.
- B. Cleaning:

1. Immediately remove accidental spatter and spillage and restore the damaged surfaces to perfect condition. Completely remove paint spots and spatter on glass, porcelain fixtures, and other surfaces and clean the surfaces.
2. At the completion of finishing operations in each space or room, remove materials, supplies, debris and rubbish from the areas and leave in a clean, orderly condition.

3.5 PAINTING SCHEDULE

A. Exterior Surfaces:

1. Galvanized Metals - Gloss: (All galvanized surfaces exposed to sight and/or weather).
 1 coat Galvanized Metal Primer
 2 coats Polyurethane Enamel - Gloss
2. Steel Doors and Frames - High Performance Gloss:
 1 coat Organic Zinc Primer*
 2 coats Polyurethane Enamel – Semi-Gloss

 *Omit primer on surfaces shop primed with organic zinc primer.
3. Iron and Steel - Gloss: (All other iron and steel surfaces exposed to sight and/or weather).

 2 coats Ferrous Metal Primer*
 1 coat Intermediate Metal Undercoat - Exterior
 1 coat Acrylic Gloss Enamel

 *Omit first coat on shop-primed surfaces.
4. Wood - Painted Semi-Gloss:

 1 coat Wood Primer - Exterior
 2 coats Wood Trim Enamel - Semi-Gloss

B. Interior Surfaces:

1. Steel Doors and Frames - Non-Blocking Semi-Gloss:

 1 coat Ferrous Metal Primer*
 1 coat Acrylic Enamel Undercoat - Interior
 1 coat Acrylic Enamel-Non Blocking - Semi-Gloss - Interior

 *Omit 1st coat on shop-primed surfaces.
2. Metals - Acrylic Latex Enamel Semi-Gloss: (All other metals Including exposed piping, conduit, electrical panels, miscellaneous brackets, bolts, fasteners, supports, prime coated hardware, casing beads, metal grilles and exposed ducts etc., other than plated or factory finished items).

 1 coat Ferrous Metal Primer*
 1 coat Acrylic Enamel Undercoat - Interior
 1 coat Acrylic Latex Enamel - Semi-Gloss - Interior

 *Omit 1st coat on shop-primed surfaces.

3. Gypsum Board - Acrylic Latex Enamel Semi-Gloss:
 - 1 coat Vinyl Acrylic Sealer
 - 1 coat Acrylic Enamel Undercoat - Interior
 - 1 coat Acrylic Latex Enamel - Semi-Gloss - Interior
4. Wood - Acrylic Latex Enamel - Semi-Gloss:
 - 1 coat Acrylic Enamel Undercoat - Interior
 - 2 coats Acrylic Latex Enamel - Semi-Gloss – Interior
5. Miscellaneous: Construction visible through screen vents and grilles shall have one heavy coat of flat black paint.

END OF SECTION

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SECTION 10 14 00

SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior and exterior room identification signs.
 - 2. Parking signs.
- B. Related Documents: the Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard referenced in paragraph 1.6.A.

1.3 REFERENCES

- A. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference. Refer to Section 01 42 00 for information concerning availability and use of references.

ASTM International (ASTM)
National Association of Architectural Metal Manufacturers (NAAMM)

1.4 ACTION SUBMITTALS

- A. Product Data: Submit product data for specified products. Include material details for each sign specified.
- B. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including dimensions, anchorage, and accessories.
 - 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.
 - 4. Schedule of Room Name Signs (text and numbers) to be reviewed and approved by School Administration prior to sign fabrication.
- C. Samples: One sample of each type of sign. Each sample shall consist of a complete sign panel with letters and symbols. Samples may be installed in the work, provided each sample is identified and location recorded. Two samples of manufacturer's standard color chips for each material requiring color selection.
- D. Installation: Submit manufacturer's installation instructions.
- E. Closeout Submittals:

1. Submit operation and maintenance data for installed products, including precautions against harmful cleaning materials and methods.
2. Submit warranty documents specified herein.

F. Submittal procedures and quantities are specified in Section 01 33 00.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals. Include precautions against harmful cleaning materials and methods.

B. Submit warranty documents specified herein.

1.7 REGULATORY REQUIREMENTS

A. Requirements for Physically Disabled: Provide identifying devices meeting the 2010 ADA Standards for Accessible Design, and 2016 California Building Code (CBC) Title 24 Part 2; Chapter 11B, Division 7 - Communication Elements and Features, with ANSI 2012 Supplement, and sections as follows:

1. Signs, General: Section 11B-703.1.
2. Raised Characters: Section 11B-703.2.
 - a. Depth: Section 11B-703.2.1.
 - b. Case: Section 11B-703.2.2.
 - c. Style: Section 11B-703.2.3.
 - d. Character Proportions: Section 11B-703.2.4.
 - e. Character Height: Section 11B-703.2.5.
 - f. Stroke Thickness: Section 11B-703.2.6.
 - g. Character Spacing: Section 11B-703.2.7.
 - h. Line Spacing: Section 11B-703.2.8.
 - i. Format: Section 11B-703.2.9.
3. Braille Symbols: Section 11B-703.3. Braille shall be California contracted (Grade 2).
4. Installation Height and Location: Section 11B-703.4.
5. Visual Characters: Section 11B-703.5.
6. Pictograms: Section 11B-703.6.
7. Symbols of Accessibility: Section 11B-703.7.
 - a. Finish and Contrast: Section 11B-703.7.1.
 - b. Symbols: Section 11B-703.7.2.
 - 1) International Symbol of Accessibility: Section 11B-703.7.2.1.
 - 2) Assistive Listening Systems: Section 11B-703.7.2.4.
 - 3) Toilet Facilities Geometric Symbols: Section 11B-703.7.2.6.

B. Braille Symbols: California contracted (Grade 2) braille shall be used wherever braille symbols are specifically required. Dots shall be 1/10-inch (2.5 mm) on center in the same cell with 3/10-inch space between cells measured between the second column of dots in the first cell to the first column of dots in the adjacent cell. Dots shall be domed or rounded profile, and raised a minimum of 1/40-inch above the background. Comply with CBC Table 11B-703.3.1 – Braille Dimensions.

C. Inspection: Signs and identification devices shall be field inspected after installation and approved by the enforcing agency prior to the issuance of a final certificate of occupancy per 2016 CBC, Chapter 1, Division II, Section 111, or final approval where no certificate of occupancy is issued. The inspection shall include, but not be limited to, verification that Braille

dots and cells are properly spaced and the size, proportion and type of raised characters are in compliance with these regulations. CBC Section 11B-703.1.1.2.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.
- D. Handle products in accordance with manufacturer's instructions.

1.9 WARRANTY

- A. Project Warranty: Comply with requirements of Section 01 78 36.
- B. Manufacturer's Warranty: Submit manufacturer's standard warranty document executed by authorized company official.
 - 1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS – EXTERIOR PLAQUE SIGNS

- A. Sign finish shall comply with the following performance requirements:
 - 1. Weatherability: When tested in accordance with ASTM G 53, after 500 hours in a Weatherometer (equivalent to approximately 3 years exterior exposure):
 - a. Gloss retention not less than 88.0 determined in accordance with ASTM D 523 at a 60 degree angle.
 - b. Color shall not change more than 1.68 units determined in accordance with ASTM D 2244 and measured with a Hunter Colorimeter, Model D25.
 - 2. Durability: Sign finish shall show no effect after repeated use of cleaners such as Graffiti Remover #1120 manufactured by Fine Organics Corp., Lodi, NJ.

2.2 SIGNAGE SYSTEMS

- A. Interior Plaque Signs: Acceptable manufacturers:
 - ASI Signage Innovations™; www.asisignage.com
 - Mohawk Sign Systems, Inc.®; www.mohawksign.com
 - Substitutions: Section 01 25 00 – Substitution Procedures.
- 1. Basis of Design Product: ASI Sign Systems; InForm Plaque Signs with requirements indicated for materials, thickness, finish colors, designs, shapes, sizes and details.
- 2. Sign Types: As shown on drawings.

B. Exterior Plaque Signs: Acceptable product or equal:

Advance Corporation, Braille-Tac™ Division; www.advancecorp.com;
Substitutions: Section 01 25 00 – Substitution Procedures.

1. Basis of Design Product: Advance Corporation, Braille-Tac™ Division; Model: Braille-Tac™ Chemcast™ (etched magnesium) sign systems.
2. Sign Types: As shown on drawings.

2.3 MATERIALS

A. Aluminum Alloy Products:

1. Sheet or Plate, ASTM B209, alloy selected to meet the structural requirements of the specific application. Surface finish shall be smooth, free of extrusion marks or imperfections.
2. Extrusions: ASTM B221, alloy 6063-T5, or other alloy of equivalent durability and strength properties. Extrusions shall have a wall thickness of not less than 0.125-inch except 0.093-inch when reinforcing bosses are provided.
3. Aluminum Castings: ASTM B26 or ASTM B108, alloy and temper recommended by aluminum producer or finisher for casting process used and for use and finish indicated.

B. Zinc and Magnesium Alloy Plates: Metal alloys specifically formulated for photo chemical etching.

C. Acrylic Sheet: ASTM D4802, Category A-1, finish 1. Acceptable products, or equal:

Atohaas North America, Inc.; Plexiglas G
Cyro Industries; Acrylite GP

D. Photosensitive Polymer Sheet: Polyamid resin material specifically formulated for photo chemical etching.

2.4 TEXT AND GRAPHICS APPLICATION METHODS

- A. Silkscreened Graphics: Execute silkscreened images with photo screens prepared from original art. No handcut screens will be accepted. Original art shall be defined as artwork that is a first generation reproduction of the specified art. All edges and corners shall be clean cut. Rounded corners, cut or ragged edges, edge build-up, bleeding, or surface pinholes will not be accepted.
- B. Die Cut Graphics: Ensure that all edges and corners of finished letterforms and graphics are true and clean. Do not use letterforms and graphics with rounded positive or negative corners, nicked, cut, or ragged edges.
- C. Engraved Graphics: Machine-engrave letters, numbers, symbols, and other graphic devices into sign panel on the face indicated to produce precisely formed copy, incised to uniform depth. Use high-speed cutters mechanically linked to master templates in a pantographic system or equivalent process capable of producing characters of the style indicated with sharply formed edges.

- D. Photetched Graphics: Photographically generate text, graphics, and braille and chemically etch the polymer or metal to produce 1/32-inch raised text, graphics, and braille.

2.5 SIGN MATERIALS – INTERIOR PLAQUE SIGNS

- A. Sign Face: Extruded Engineered PVC/Acrylic alloy with Integral background colors and high impact resistance.
- B. Tactile Graphics and Text: Provide tactile copy and grade 2 Braille raised 1/32 inch minimum from plaque surface using manufacturer's co-molding process. Glued on letters are unacceptable.
 - 1. Provide lettering and graphics precisely formed, uniformly opaque to comply with relevant CBC and ADA regulations and requirements indicated for size, style, spacing, content, position, and colors.
 - 2. Text Color: Selected by Architect from manufacturer's standard color chart.
- C. Colors: High contrast semi-matte integral colors for graphics. All integral resins shall be U.V. stabilized resins utilizing automotive grade pigments.
- D. Standard Material Colors: Selected by Architect from manufacturer's standard colors.

2.6 SIGN MATERIALS – EXTERIOR PLAQUE SIGNS

- A. Braille-Tac™ one-piece construction sign system utilizing Chemcast™ chemical etch process to produce raised numbers and letters with corresponding dome shaped, California Grade II Braille (complying with Specification #800), and pictograms, on magnesium alloy sign, all complying with ADA and CABO/A117.1 requirement. All signage will provide 70% contrast between text and background.
- B. Standard Material Colors: Selected by Architect from manufacturer's standard colors.

2.7 PARKING SIGNS

- A. Acceptable manufacturer or equal:

Seton; www.seton.com
Traffic and Parking Control Company; www.tapco.net
Substitutions: Section 01 25 00 – Substitution Procedures.”
- B. Sign Panels: Construct sign panels of 20-gage minimum hot-dip galvanized steel sheet or 0.080-inch thick engineer grade reflective aluminum sheet, with rounded corners. Clean and prepare surfaces to assure maximum paint adhesion and paint with reflectorized porcelain enamel. Apply legends, symbols and borders using the silkscreen process.
 - 1. Minimum \$250 Fine Sign:
 - a. Dimensions: As shown on drawings.
 - b. Graphics: As shown on drawings.
 - 2. Tow Away Sign:
 - a. Dimensions: 17" W x 22" H.
 - b. Graphics: As shown on drawings.
- C. Posts: 2-1/2-inch diameter galvanized steel, standard weight pipe posts.
- D. Concrete for footing: Minimum 2500 psi concrete.

- E. Comply with 2016 CBC Title 24 Part 2, Chapter 11 and 2010 ADA Standards for Accessible Design, for handicapped accessibility requirements.

2.8 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, 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. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
- B. Adhesives: Type recommended by the manufacturer of the material specified to be laminated or adhered. No adhesives that will fade, discolor or delaminate as a result of proximity to sunlight or heat there from shall be used. Adhesives shall not change the color or otherwise deteriorate the materials to which they are to be applied. The adhesives shall be of non-staining, nonyellowing quality.
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.
- D. Magnetic Tape: Manufacturer's standard magnetic tape with adhesive on one side.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.9 FABRICATION - GENERAL

- A. General: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
 - 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.

2.10 ALL SIGNAGE CRITERIA

- A. Character and symbol size for all signs as follows:
 - 1. On visual signs, size characters and symbols according to viewing distance. Sign mounted 80" or more AFF must have 3" high (minimum) characters.
 - 2. Pictograms (pictorial symbols) and ISA's (International Symbol of Accessibility) on interior signs at eye level should be 3" (minimum) high or twice as high as height of largest text on sign, whichever is greater. On signs where the bottom is 72" or more AFF, (minimum) pictograms or ISA's should be 6" high or twice as high as height of largest text on sign, whichever is greater. NOTE: Pictograms and other symbols, such as ISA's, which are included on signs with raised characters and Braille, are not required to be raised. The ISA, when included on a tactile sign, does not require any accompanying text, either visual or tactile.
 - 3. On tactile signs, raised characters must be 5/8" minimum and 2" maximum in height.
 - 4. Pictograms that identify rooms and spaces, such as gender pictograms for restrooms must be in a 6" (minimum) height field directly above accompanying raised text and California Braille. No characters or Braille in field.
- B. Provide English language signs typical. Provide Spanish language signs where designated and scheduled.

2.11 FABRICATION - INTERIOR PLAQUE SIGNS

- A. Panel Depth: 0.125" thickness for all plaques except Toilet Room Door Signs which shall have 0.250" thick components.
- B. Panel Appearance:
 - 3. Semi-matte clear with color showing through back.
 - 4. Color: As selected by Architect from manufacturer's standard selection.
- C. Surface Texture: Matte.
- D. Letter Style, Size, and Layout Position:
 - 3. Fonts: As shown on drawings.
 - 4. Size: As shown on drawings.
 - 5. Layout Position: As shown on drawings.
- E. Braille Style and Size and Layout Position: Grade 2 California Braille, raised (integral) and translucent same as face of sign.
- F. Text Schedule: As shown on Drawings.
- G. Sign Size: Refer to Sign Type Drawings.
- H. Plaque Edge Detail: Straight.
- I. Installation Method: MH, mounting holes for tamper proof mechanical fasteners and SA, silicone adhesive.
- J. General: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

- K. Preassemble signs in the shop to the greatest extent possible to minimize field assembly. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in a location not exposed to view after final assembly.
- L. Form panels to required size and shape. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.
- M. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.

2.12 FABRICATION – EXTERIOR PLAQUE SIGNS

- A. Panels: Fabricate panels from 1/8-inch thick photo sensitized magnesium or zinc alloy. Chemically etch the background to provide borders, text, graphics, and Braille that extend not less than 1/32-inch above the background.
- B. Message: As indicated on the Drawings and determined by the Architect before fabrication.
- C. Type Face:
 - 1. Letters: Unless otherwise indicated, provide upper and lower case letters, Meta Plus Medium font, 5/8" high.
 - 2. Numbers: Unless otherwise indicated, provide numbers of Book Font, 1" high, raised minimum 1/32" from sign face.
- D. Sign Finish: Factory applied baked-on-acrylic polyurethane enamel, UV inhibited.
- E. Colors: Sign shall consist of minimum of two colors (text color and 70% contrasting background color). Final colors as selected by Architect from manufacturer's standard colors.

2.13 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 EXAMINATION

- A. Site Verification of Conditions: Verify installation conditions previously established under other sections are acceptable for product installation in accordance with manufacturer's instructions.
- B. Scheduling of Installation: Start of installation implies that substrate and conditions are prepared and ready for product installation. Proceeding with installation implies installer's acceptance of substrate and conditions.

3.2 INSTALLATION

- C. 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.
- D. Accessibility: Install product at heights to conform to 2010 ADA Standards for Accessible Design, and applicable local amendments and regulations.
- E. Mounting Methods: Install product in locations indicated using mounting methods recommended by sign manufacturer and free from distortion, warp, or defect adversely affecting appearance. Do not install signs on doors or other surfaces until finishes on such surfaces have been applied.
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.
 4. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
 5. Magnetic Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position.
 6. Adhere signs to glass with adhesive or two-face tape.
- F. Install signs within the following tolerances and in accordance with manufacturer's recommendations:
1. Interior Signs: Within 1/4 inch vertically and horizontally of intended location.
 2. Exterior Signs: Within 1 inch vertically and horizontally of intended location.
- G. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite of glass to conceal back of sign.
- H. Direct-Burial Method for Posts:
1. Excavation: Excavate posthole to dimensions indicated.
 2. Setting in Cast-in-Place Concrete Footings: Set post in position, support to prevent movement, and place concrete in posthole as indicated.

3.3 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.

3.4 SIGN SCHEDULE

- A. Schedule: Refer to signage schedule as shown on Drawings for sizes, locations, and layout of signage types, sign text copy, and graphics.

END OF SECTION

01/11/19

SECTION 22 00 00
PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. The General Conditions, Supplementary Conditions, and Division 1 General Requirements apply to the work specified in this Section.

1.2 SUMMARY

- A. All materials and operations for a complete and operating plumbing and drainage system, including, but not necessarily limited to, the following:
1. Demolition of certain plumbing equipment, piping and related accessories.
 2. Natural gas piping including connections to existing piping.
 3. Condensate drain piping.
 4. Connection to mechanical equipment.

1.3 RELATED WORK

- A. Electrical Systems, Section 26 00 00.
- B. Heating, Ventilating and Air Conditioning Systems, Section 23 00 00.

1.4 GENERAL REQUIREMENTS

- A. Verification of conditions:
1. Prior to installation of plumbing work, Contractor shall inspect all surfaces to receive said work and arrange with the General Contractor for the satisfactory correction of all defects in workmanship and/or material that could interfere with the work specified herein.
 2. Installation of any plumbing work or materials on any surface shall constitute acceptance by the Contractor of such surfaces as being in proper condition to receive herein specified materials.
- B. Examination of site: Examine site prior to bidding. Compare it with drawings and specifications. Check conditions and take measurements, which may affect work. No allowance shall subsequently be made for any extra expense due to failure to make such examination.
- C. Manufacturer's directions: Follow manufacturer's directions covering points not shown on the drawings or specified herein. Manufacturer's directions do not take precedence over drawings and specifications. Where these are in conflict with drawings and specifications, notify Architect for clarifications before installing the work.

- D. Codes: Work and materials shall be in full accordance with all applicable local or state ordinances, California Building Code, California Plumbing Code, National Fire Protection Association, State of California Safety Orders, and State Fire Marshal. Whenever drawings and specifications require larger sizes or higher standards than are required by regulations, drawings and specifications govern. Whenever drawings or specifications require something, which will violate regulations, regulations govern. No extra charge will be paid for furnishing items required by regulations but not specified or shown on drawings.
- E. Cooperation with other trades: 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 and piping are to have the highest priority. All plumbing work is to be coordinated with the Mechanical Contractor such that the ductwork and piping 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.
- F. Licenses, permits, services, and fees: Secure and pay for all licenses required to begin, perform, and complete work.
- G. Quietness of operation: Adjust, repair, or replace any equipment producing objectionable noise or vibration in any occupied areas of building, including providing additional brackets, bracing, etc., to prevent objectionable noise or vibration.
- H. All components of the cold water system are to be in full compliance with CA AB 1953.

1.5 SUBMITTALS

A. General:

- 1. Refer also to Division 1 for additional submittal requirements.
- 2. When specific names are used in connection with materials, they are used as standards only, but this implies no right to use other materials or methods unless approved by the Architect.
- 3. Decision of the Architect shall govern as to what materials are acceptable substitutions. Burden of proof as to equality of any proposed fixtures, material, or equipment shall be upon the Contractor. Petition in favor of proposed substitute materials shall be made directly by the Contractor. If any tests are necessary to determine quality of proposed items, such tests shall be made at the expense of the Contractor by an unbiased laboratory satisfactory to the Architect.
- 4. Submit shop drawings and material list in six (6) copies. Submit material list and shop drawings after official award of contract. Obtain approval of the Architect before installation. Shop drawings shall be submitted for all materials, equipment, and controls.
- 5. Check shop drawings and submittals before forwarding to Architect and ascertain that submittals meet all requirements of drawings and specifications and conform to structural space conditions.
- 6. Shop drawings also shall be prepared for modifications to architectural, electrical, and mechanical work required by proposed materials - i.e., relocation of drains, revised electrical circuits, relocation of penetrations, etc.

7. Installation of any approved substituted equipment is the Contractor's responsibility and any changes required to work included under other sections for installation of approved substituted equipment must be made to the satisfaction of the Architect and without any additional cost. Approval by Architect of substituted equipment and/or dimension drawings does not waive these requirements.
8. Review of drawings and materials submitted for approval shall not be construed as a complete check or constitute a waiver of the requirements of the drawings and specifications. This review shall not relieve the Contractor of the responsibility to fit the proposed materials to the spaces provided and to effect necessary rearrangement or construction of other work. Contractor agrees that shop drawing submittals processed by the Architect do not become contract documents and are not change orders; that the purpose of the shop drawing review is to establish a reporting procedure and is intended for the Contractor's convenience in organizing his work and to permit the Architect to monitor the Contractor's progress and understanding of the design. If deviations, discrepancies, or conflicts between shop drawing submittals and the contract documents are discovered either prior to or after the shop drawing submittals are processed by the Architect, the Contractor agrees that the contract documents shall control and shall be followed.
9. Submittal lists shall include the identifying marks assigned to the items. Give name of manufacturer, brand name, and catalog number of each item. Submit complete list at one time with items arranged and identified in numerical sequence within each section and article specifications. Listing items "as specified" without both make and model or type designation is not acceptable, except as noted. Only pipe and fittings not specified by brand names may be listed "as specified" without manufacturer's name, provided proposed materials comply with specification requirements.
10. Descriptive Data: Submit six (6) copies of complete description information and performance data covering equipment that is specified but for which catalog plate numbers, brand names, or specific models have not been used.
11. Submittal of substitutions shall be limited to one proposal for each type or kind of item, unless otherwise permitted by the Architect.

1.6 DRAWINGS, SPECIFICATIONS, AND COORDINATION OF WORK

- A. Drawings are essentially diagrammatic. Size and locations of equipment are generally shown to scale. Make use of data in all Contract Documents, and verify this information against field conditions.
- B. The drawings indicate the required size and point of termination of ductwork, pipes, and equipment. Install pipe with all necessary offsets and fittings to conform to the structure, avoid obstructions, preserve headroom, maintain required accessibility, and satisfy the requirements of the governing codes and the standards of good practice.
- C. Where changes in indicated locations or arrangements are necessary due to conditions in building construction, interference with work in other divisions, or conflict in location, make changes at no cost to the Owner. Deviations, offsets, rises or drops in piping that may be necessary, whether shown or not, shall be made at no expense to Owner.
- D. Bring discrepancies between different drawings, between drawings and actual field conditions, or between drawings and specifications promptly to the attention of the Engineer for decision, and stop all work on affected areas subject to resolution of the conflict.

1.7 MATERIALS AND WORKMANSHIP

- A. All materials and equipment to be new and in perfect condition. Materials or equipment for similar uses are to be of same type and manufacturer.
- B. Workmanship shall be of best standard practice of the trade.

1.8 PROTECTION OF EQUIPMENT

- A. The Contractor shall be responsible for damage to any of the work of this section until final acceptance. Cover all openings, apparatus, equipment, and appliances both before and after being set in place to prevent misuse or disfigurement of the apparatus, equipment, or appliances.

1.9 OPENINGS

- A. The Contractor shall cooperate with other trades in providing information for openings required in walls, floors, and roof for pipe and equipment.
- B. The Contractor shall pay all extra costs for cutting of openings as a result of incorrect, delayed, or neglected information.
- C. Make absolutely watertight any openings through waterproofed construction caused by the penetration of piping and in a manner approved by the Architect.

1.10 CLEAN-UP

- A. Thoroughly clean all parts of the apparatus and equipment. Exposed parts which are to be painted shall be thoroughly cleaned and all grease and oil spots removed with cleaning solvent.
- B. Remove all debris and surplus equipment and leave installation in perfect condition ready for use.

1.11 CONSTRUCTION REVIEW

- A. All services rendered by the Architect or any of his consultants consist of professional opinions and recommendations made in accordance with generally accepted engineering practice.
- B. Under no circumstances is it the intent of the Architect or any of his consultants to directly control the physical activities of the Contractor or the Contractor's workmen in the accomplishment of work on this project.
- C. The presence of the field representative of the Architect or any of his consultants at the site is to provide to the Owner and/or Architect an additional source of professional advice, opinions, and recommendations based upon the field representative's observations.

1.12 SAFETY

- A. In accordance with generally accepted construction practices, the Contractor will be solely and completely responsible for conditions on the jobsite, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours.

- B. Construction review by the Architect or any of his consultants is not intended to include review of the adequacy of the Contractor's safety measures in, on, or near the construction take out extra space site or at any other location.

1.13 OPERATING INSTRUCTIONS

- A. Comply with the requirements of Division 1 – General Requirements.
- B. Upon completion of work, the Contractor shall place a competent person in charge who will operate the system and instruct the Owner's representative in all details of the operation and maintenance of the plumbing system.
- C. The Contractor shall carefully prepare four (4) descriptive booklets of the entire plumbing systems and a full description of the operation and maintenance of each piece of equipment.
- D. Operating instruction manuals are to include names, addresses, and telephone numbers for the following: Project name, Owner, General Contractor, Plumbing Subcontractor, and equipment manufacturer's (including local representatives).

1.14 GUARANTEE

- A. The Contractor shall furnish a written guarantee to the Owner that the new materials, equipment, and installation are new, free from mechanical defects, noiseless, and are in perfect operating condition.
- B. The Contractor shall guarantee to replace and repair at his own expense any and all unsatisfactory and defective work and items to the satisfaction of the Owner for a period of one (1) year after systems have been accepted by the Architect and are put to beneficial use.
- C. The Contractor shall also furnish the Owner with all manufacturer's written guarantees of materials and equipment.
- D. Refer also to Division 1 requirements

1.15 RECORD DRAWINGS

- A. Refer to Division 1 – General Requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Condensate drain piping:
 - 1. Type M copper tubing ANSI H23.1 with wrought copper sweat fittings ANSI B16.22 joined with lead free solder.
- B. Natural gas piping:
 - 1. Above grade: Schedule 40 black steel pipe ANSI B125.2 and 150 PSI black malleable iron screwed fittings ANSI B16.3 for piping 2" and smaller and seamless

welded joint 2-1/2" and larger. Pipe and fittings outside of the buildings are to be galvanized. Wrap below grade piping per AWWA HOC 203.

C. Unions and flanges:

1. Steel pipe unions: Malleable iron ground joint pattern with brass to iron seats, 150 psi.
2. Steel pipe flanges: ANSI B16.C, 150 psi forged steel welding type with flat face.
3. Copper tubing unions: 150 psi ground joint cast bronze unions with sweat connections.
4. Copper tubing flanges: ANSI B16.24, bronze, 150 psi to match standard ASA 150 psi steel flanges with flat face.
5. Flange gaskets: Crane Co Cranite, 1/16" full face sheet packing, 150 psi. Coat gaskets with thread lubricant before installation.

D. Dielectric protection:

1. Location: For connection between dissimilar metals in the piping systems to control corrosion caused by galvanic or electrolytic action. No dielectric unions allowed.
2. Listing: Victaulic Style 47, Lochinvar V-line, Waterway or equal.
 - a. Dielectric couplings: Threaded for sizes 2 inches and smaller, grooved or flanged for 2-1/2 inches and larger.

E. Thread lubricant for steel pipe: Armit Joint Seal Compound No. 250.

F. Valves: Shall be a product of single manufacturer, Red-White, NIBCO, Milwaukee or equal.

1. Gate valves (threaded): #280, bronze, 125 psi.
2. Gate valves (solder): #281, bronze, 125 psi.
3. Ball valves (threaded): #5092, bronze, 400 psi.
4. Ball valves (solder): #5095, bronze, 400 psi.
5. Ball valves (natural gas): #5044F, Brass Body, 600 psi, full port.
6. Valves shall be same size as line in which they are installed. No valve shall be installed with stem pointed below horizontal.

G. Pipe sleeves: Adjus-To-Crete 24 ga., electrogalvanized sheet metal adjustable sleeve, or equal.

H. Pipe hangers and supports: superstrut or equal.

1. Plumbing piping – soil, waste, and vent:
 - a. Conform to ASME B31.9.
 - b. Hangers for pipe sizes ½ inch to 1-1/2 inches: Malleable iron, adjustable swivel, split ring.

- c. Hangers for pipe sizes 2 inches and over: Carbon steel, adjustable, clevis.
 - d. Multiple or trapeze hangers: Steel channels with welded spacers and hanger rods.
 - e. Copper pipe support: Carbon steel ring, adjustable, copper plated.
2. Plumbing piping – water:
- a. Conform to ASME B31.9
 - b. Hangers for pipe sizes ½ inch to 1-1/2 inches: Malleable iron, adjustable swivel, split ring.
 - c. Hangers for cold pipe sizes 2 Inches and over: Carbon steel, adjustable, clevis.
 - d. Hangers for hot pipe sizes 2 Inches to 4 inches and over: Carbon steel, adjustable, clevis.
 - e. Multiple or trapeze hangers: Steel channels with welded supports and hanger rods.
 - f. Copper pipe support: Carbon steel ring, adjustable, copper plated.
- I. Seismic bracing: Conform to SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems, Second Edition, 1998.
- J. Piping identification:
- 1. Piping identification shall be manufactured by Marking Services, Incorporated or equal.
 - 2. Materials:
 - 3. Color: Unless specified otherwise, conform with ANSI/ASNE A13.1.
 - 4. Plastic nameplates: Laminated 3-layer plastic with engraved black 2 inch high letters on light contrasting background color.
 - 5. Metal tags: brass aluminum with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
 - 6. Plastic pipe markers: Factory fabricated, flexible, semi-rigid, preformed to fit around pipe or pipe covering, minimum information indicating flow direction arrow and fluid being conveyed.
- K. Escutcheon plates: For pipes passing through finished ceilings, walls, and floors in conspicuous locations, use chromium-plated steel floor and ceiling plates with set screw or other approved means of holding securely in place.

PART 3 - EXECUTION

3.1 GENERAL

- A. Support exposed and concealed piping on specified hangers properly spaced and set to allow piping to adjust for temperature change expansion and contraction. Evenly space and support piping in parallel.
- B. Coordinate with other trades to provide continuous support channel for all pipes and conduit in exposed locations.
- C. Conceal piping in ceilings, furred walls, partitions and pipe spaces, except where noted otherwise. Provide maximum head room and run piping to maintain proper clearance for piping runs beforehand and with other divisions to insure clearance. Where work of other divisions prevents installation of piping shown on drawings, reroute piping as directed by Engineer at no extra cost to Owner.
- D. Install exposed piping parallel to or at right angles with building walls.
- E. No valve, piece of equipment, or trim shall support the weight of any pipe. Install valves, traps, cleanouts, etc., in accessible locations.
- F. Install piping free from traps and air pockets.
- G. Use special wrenches in assembly of polished, chrome plated tubing and fittings so that no tool marks are left on pipe or fittings.
- H. Wherever changes in sizes of piping occur, use reducing fittings.
- I. Install unions adjacent to threaded valves, equipment, and at other points where required for disassembly.
- J. Provide sleeves wherever pipes run through walls, slabs, beams, footings, and floors large enough for passage of pipe and/or pipe insulation. Sufficiently size sleeves to allow for contraction and expansion of pipe. Pack sleeves with approved packing material. Pack sleeves in walls and slabs below grade and through exterior walls above grade with waterproof mastic or grout.
- K. Where sleeves are missed or misplaced during canning, core holes with rotary diamond tooth core drills.
- L. Fit exposed pipes, which pass through walls, ceilings, or floors in finished rooms and conspicuous locations with escutcheon plates.
- M. Install insulating unions or flanges at ferrous and nonferrous piping connections.

3.2 PIPE HANGERS, SUPPORTS, AND BRACES

- A. General: Support piping from building structure so that there is no apparent deflection in piping runs. Fit piping with steel sway braces and anchors to prevent vibration and/or horizontal displacement under load when required. Support piping only by approved pipe hangers. Pipes shall not be supported from, or braced to, ducts, other pipes, conduits, or any materials except building structure. Piping or equipment shall not be supported or hung by wire, rope, plumbers tape, or blocking of any kind.
- B. Hanger spacing (not for piping or multiple piping supports):

<u>Type of Pipe</u>	<u>1-1/2" diam. & smaller</u>	<u>2" diam. & lgr</u>
Steel pipe	8'- 0"	10'- 0"
Copper tubing	6'- 0"	8'- 0"
Cast iron pipe	All sizes 5'- 0" max. and not less than one hanger per joint	

- C. Multiple piping support: 6'- 0".
- D. Support vertical piping at each floor level with rise clamps.
- E. Piping at completion of job shall be rigid and immobile. Install additional pipe supports, brackets, and hangers as required to accomplish a rigid and immobile piping system.
- F. Double wrap copper pipe with heavy vinyl tape where pipe comes in contact with ferrous materials.

3.3 CLEANING

- A. Thoroughly clean exterior and interior of piping, equipment, and materials before systems are put in operation. Clean plumbing fixtures with soap and water. Remove marks and labels. Clean and polish chrome. Remove paint, concrete, plaster, and other foreign materials. Clean valve handles and stems of any paint, dirt, or other foreign materials. Clean drains of dirt and debris. Remove shipping paper from cleanout covers and polish. Remove and clean out dirt and debris from pipe spaces, including wire and blocking.

3.4 TESTING

- A. Condensate drain piping: Test with minimum height of stand pipe 10'-0". Test duration to be a minimum of four (4) hours.
- B. Gas piping: Test with air under pressure of 100 psi for a minimum test duration of four (4) hours.
- C. If systems are tested in sections, include connection to previously tested section. Final pressures at end of test period shall be no more nor less than that caused by expansion or contraction of test medium due to temperature changes. Apply tests for a minimum period of four (4) hours or as required by local codes or agencies having jurisdiction. Where testing pressures are higher than rated pressure for equipment, or special trim, remove and bypass item with temporary piping for purposes of test.
- D. Testing shall be done in the presence of the Owner's representatives.

3.5 PIPING IDENTIFICATION

- A. Installation:
- B. Degrease and clean surfaces to receive adhesive for identification materials.
- C. Plastic nameplates: Install with corrosive-resistant mechanical fasteners or adhesive.
- D. Plastic pipe markers: Install in accordance with manufacturer's instructions. Maximum spacing is to be twenty (20) feet on center.
- E. Valves: Identify valves in main and branch piping with tags.
- F. All exposed piping and piping above accessible ceilings shall be neatly identified spaced not more than twenty (20) feet on center.

END OF SECTION

SECTION 23 00 00

HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. The General Conditions, Supplementary Conditions, and Division 1 General Requirements apply to the work specified in section.

1.2 SUMMARY

- A. The work shall consist of furnishing all labor, material, and equipment required to complete the installation of the heating, ventilating, and air conditioning (HVAC) systems as indicated on the Drawings and described herein, including all incidental work necessary to make it complete and satisfactory and ready for operation. Work shall include, but not be limited to, the following principal items:
 - 1. Demolition of certain HVAC equipment, duct, piping and related accessories.
 - 2. Variable refrigerant flow (VRF) system:
 - a. VRF outdoor units.
 - b. VRF fan coil units.
 - c. VRF branch circuit (BC) controllers.
 - d. VRF controls.
 - 3. Cabinet supply fans.
 - 4. Cabinet exhaust fan.
 - 5. Gravity hoods.
 - 6. Refrigerant piping.
 - 7. Ductwork systems complete with necessary volume dampers, access doors, hangers, supports, and accessories for the following service:
 - a. Supply air.
 - b. Return air.
 - c. Exhaust air.
 - d. Transfer air.
 - e. Outside air intake.
 - 8. Insulation and covering for piping, duct, and equipment.
 - 9. Access panels and doors in ductwork and plenums.

10. Access panels in ceilings which relate to this trade, furnishing shop drawings, and coordination for the proper location of the panels.
11. Miscellaneous, including instruments, sleeves, flashings, tags and markings, and all accessories and items necessary for a complete installation.
12. Testing and adjusting all system components.
13. Complete control systems including:
 - a. Thermostats.
 - b. Sensors.
 - c. Low voltage wiring.
 - d. Coordination with other trades to ensure required work is completed.
 - e. Check-out and commissioning of control systems to verify sequences of operation are in accordance with the drawings.

1.3 RELATED WORK

- A. Plumbing Systems, Section 22 00 00.
- B. Electrical Systems, Section 26 00 00.
- C. Roofing Alterations, Section 07 01 50.
- D. Acceptance Requirements, Section 23 05 00.

1.4 GENERAL REQUIREMENTS

- A. Verification of conditions: Prior to installation of HVAC work, inspect all surfaces to receive said work and arrange for the satisfactory correction of all defects in workmanship and/or material that could interfere with the work specified herein. Installation of any HVAC work or materials on any surface shall constitute acceptance of such surfaces as being in proper condition to receive herein specified materials.
- B. Codes: Work and materials shall be in full accordance with all applicable local or state ordinances, California Building Code, California Mechanical Code, National Fire Protection Association, State of California Safety Orders, and State Fire Marshal. Whenever drawings and specifications require larger sizes or higher standards than are required by regulations, drawings and specifications govern. Whenever drawings or specifications require something, which will violate regulations, regulations govern. No extra charge will be paid for furnishing items required by regulations but not specified or shown on drawings.
- C. Reference standards: Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to work of this Section where cited below:
 1. Air Moving and Conditioning Association (AMCA).
 2. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).

3. American Society of Mechanical Engineers (ASME).
4. American Society of Plumbing Engineers (ASPE).
5. Associated Air Balance Council (AABC).
6. National Electrical Manufacturers Association (NEMA).
7. National Fire Protection Association (NFPA).
8. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
9. California Building Code (CBC).
10. State of California - OSHA.
11. California Mechanical Code (CMC).
12. The State of California Codes and Safety Orders.
13. 2016 California Building Energy Efficiency Standards (Title 24).
14. State Fire Marshal requirements (SFM).
15. Air Conditioning and Refrigeration Institute (ARI).
16. State of California Environmental Quality Act.
17. American Society of Testing and Materials (ASTM).
18. Underwriters Laboratories (UL).
19. Occupational Safety and Health Act (OSHA).
20. National Bureau of Standards (NBS).
21. American National Standards Institute (ANSI).
22. AMCA Standard 99: Standards Handbook.
23. AMCA/ANSI Standard 204: Balance Quality and Vibration Levels for Fans.
24. AMCA Standard 210: Laboratory Methods of Testing Fans for Ratings.
25. AMCA Standard 300: Reverberant Room Method for Sound Testing of Fans.
26. AMCA Standard 500: Test Methods for Louvers, Dampers and Shutters.
27. ARI Standard 410: Forced-Circulation Air-Cooling and Air-Heating Coil.
28. ANSI/ASHRAE 15: Safety Code for Mechanical Refrigeration.
29. ASHRAE Standard 52: Gravimetric and Dust Spot Procedures for Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
30. ASHRAE/ANSI Standard 111: Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems.

31. ASME Section VIII: Unified Pressure Vessel Code.
32. UL Standard 1995: Heating and Cooling Equipment.
33. ASTM A-525: Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
34. ASHRAE Standard 62.1-2013: Ventilation for Acceptable Indoor Air Quality.
35. Collaborative for High Performance Schools (CHPS) – 2009 Edition.
36. ANSI/ASHRAE Standard 55-2013: Thermal Environmental Conditions for Human Occupancy.

D. Materials and workmanship:

1. All materials and equipment to be new and in perfect condition. Materials or equipment for similar uses are to be of same type and manufacturer.
2. Workmanship shall be of best standard practice of the trade.

E. Protection of equipment: The Contractor shall be responsible for any damage to any of the work of this section until final acceptance. Cover all duct, pipe and equipment openings, and cover all apparatus, equipment, and appliances both before and after being set in place to prevent misuse or disfigurement of the apparatus, equipment, or appliances.

F. Openings:

1. Cooperate with other trades in providing information as to openings required in walls, floors, and roof for ducts and equipment.
2. Pay all extra costs for cutting of openings as a result of incorrect, delayed, or neglected information.
3. Make absolutely watertight any openings through waterproofed construction caused by the penetration of ductwork or piping, in a manner approved by the Engineer.

G. Cleanup:

1. Thoroughly clean all parts of the apparatus and equipment. Exposed parts, which are to be painted shall be thoroughly cleaned of cement, plaster, and other materials, and all grease and oil spots removed with cleaning solvent.
2. Inside of all pipes, ducts, etc., shall be flushed or cleaned before being placed in operation, and all strainers shall be cleaned after operational tests.
3. Remove all debris and surplus equipment and leave installation in perfect condition ready for use.

H. Construction review:

1. All services rendered by the Architect or any of his consultants consist of professional opinions and recommendations made in accordance with generally accepted architectural practice.
2. Under no circumstances is it the intent of the Architect or any of his consultants to directly control the physical activities of the Contractor or the Contractor's workmen in the accomplishment of the work.

3. The presence of the field representative of the Architect or any of his consultants at the site is to provide to the Owner and/or Architect an additional source of professional advice, opinions, and recommendations based upon the field representative's observations.
- I. Safety:
 1. In accordance with generally accepted construction practices, the Contractor will be solely and completely responsible for conditions on the project site including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited by normal working hours.
 2. Construction review by the Architect or any of his consultants is not intended to include review of the adequacy of the Contractor's safety measures in, on, or near the project site or at any other location.
 - J. Welder's qualifications:
 1. All welding must be performed by registered welders qualified to perform welding operations in accordance with ASME Code Standards.

1.5 SUBMITTALS

- A. Refer also to Division 1 for additional submittal requirements.
- B. When specific names are used in connection with materials, they are used as standards only, but this does not imply the right to use other materials or methods unless approved by the Architect.
- C. Decision of the Architect shall govern as to what materials are acceptable substitutions. Burden of proof as to equality of any proposed fixtures, material, or equipment shall be upon the Contractor. Petition in favor of proposed substitute materials shall be made directly by the Contractor. If any tests are necessary to determine equality of proposed items, such tests shall be made at the expense of the Contractor by an unbiased laboratory satisfactory to the Architect.
- D. Submit shop drawings and material list in six (6) copies. Submit material list and shop drawings after official award of contract. Obtain approval of the Architect before installation. Shop drawings shall be submitted for all materials, equipment, and controls.
- E. Check shop drawings and submittals before forwarding to Architect and ascertain that submittals meet all requirements of drawings and specifications and conform to structural conditions available.
- F. Shop drawings also shall be prepared for modifications to architectural, structural, plumbing, electrical, and mechanical work required by proposed materials - i.e., relocation of drains, revised electrical circuits, relocation of penetrations, etc.
- G. Installation of any approved substituted equipment is the Contractor's responsibility, and any changes required to work included under other sections for installation of approved substituted equipment must be made to the satisfaction of the Engineer and without any additional cost. Approval by Architect of substituted equipment and/or dimension drawings does not waive these requirements.
- H. Review of drawings and materials submitted for approval shall not be construed as a complete check or constitute a waiver of the requirements of the drawings and specifications but will indicate that the material submitted is acceptable in quality, utility, and capacity. This review shall not relieve the Contractor of the responsibility to fit the proposed

materials to the spaces provided and to effect necessary rearrangement or construction of other work. Contractor agrees that shop drawing submittals processed by the Architect do not become contract documents and are not change orders; that the purpose of the shop drawing review is to establish a reporting procedure and is intended for the Contractor's convenience in organizing his work and to permit the Architect to monitor the Contractor's progress and understanding of the design. If deviations, discrepancies, or conflicts between shop drawing submittals and the contract documents are discovered either prior to or after the shop drawing submittals are processed by the Architect, the Contractor agrees that the contract documents shall control and shall be followed.

- I. Submittal lists shall include the identifying marks assigned to the items. Give name of manufacturer, brand name, and catalog number of each item. Submit complete list at one time with items arranged and identified in numerical sequence within each section and article of the specifications. Listing items "as specified" without both make and model or type designation is not acceptable except pipe and pipe fittings not specified by brand names, which may be listed "as specified" without manufacturer's name, provided proposed materials comply with specification requirements.
- J. Descriptive Data: Submit complete description, information, and performance data covering equipment which is specified but for which catalog plate numbers, brand names, or specific models have not been used. Include fan performance curves for all equipment with fans and for each individual fan submitted.
- K. Submittal of substitutions shall be limited to one (1) proposal for each type or kind of item, unless otherwise permitted by the Architect.

1.6 DRAWINGS, SPECIFICATIONS, AND COORDINATION OF WORK

- A. Drawings are essentially diagrammatic. Size and locations of equipment are generally shown to scale. Make use of data in all contract documents, and verify this information against field conditions.
- B. The drawings indicate the required size and point of termination of ductwork, pipes, and equipment. Install pipe with all necessary offsets and fittings to conform to the structure, avoid obstructions, preserve headroom, maintain required accessibility, and satisfy the requirements of the governing codes and the standards of good practice.
- C. Where changes in indicated locations or arrangements are necessary due to conditions in building construction, rearrangement of equipment, or conflict in location, make such changes at no cost to the Owner, provided that the change is ordered before pipe ductwork and/or equipment is installed and that the length of run is not revised by more than 5 percent of the indicated run.
- D. Bring discrepancies between different drawings, between drawings and actual field conditions, or between drawings and specifications promptly to the attention of the Architect for decision, and stop all work on affected areas subject to resolution of the conflict.

1.7 OPERATING INSTRUCTIONS

- A. Comply with the requirements of Division 1 – General Requirements.
- B. Upon completion of the work, the Contractor shall place a competent person in charge who will operate the system and instruct the Owner's representatives in all details of the operation and maintenance of each piece of equipment and each system.
- C. The Contractor shall carefully prepare four (4) descriptive binders of the entire HVAC system and a full description of the operation and maintenance of each piece of equipment.

The binders shall have tabs indicating each type of equipment with sub-dividers indicating the equipment symbol shown on the drawings. An index shall be provided with page numbers for each type of equipment and each piece of equipment. The binders shall be well organized to provide easy reference.

- D. Operating instruction manuals are to include names, addresses, and telephone numbers for the following: Project name, Owner, Mechanical Contractor, and equipment manufacturers (including local representatives).

1.8 GUARANTEE

- A. The Contractor shall furnish a written guarantee to the Owner that the materials, equipment, and installation are new, free from mechanical defects, noiseless, and are in perfect operating condition.
- B. The Contractor shall guarantee to replace and repair at his own expense any and all unsatisfactory and defective work and items to the satisfaction of the Owner for a period of at least one (1) year after start-up and air and water balance are complete, the air and water balance reports have been submitted and approved and the HVAC systems are put to beneficial use.
- C. The Contractor shall also furnish to the Owner all manufacturer's written guarantees of materials and equipment.
- D. See also Division 1.

1.9 RECORD DRAWINGS

- A. Comply with the requirements of Division 1 – General Requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Access doors:
 - 1. General: All concealed equipment, valves, controls, fire/smoke dampers, volume dampers, etc., shall be provided with access doors which shall be furnished and installed by the general Contractor. Coordination for the location of access doors to ensure access to all HVAC equipment requiring access is the responsibility of this section of work. Access doors are not required in removable ceilings. Access doors which provide access to fire/smoke dampers are to be labeled with one-half inch (1/2") high letters reading "Fire/Smoke Damper."
 - 2. Access doors shall be bonderized steel, with flush screwdriver operated cam latch, fitted with concealed hinges, factory prime coated. Doors shall be Milcor, or equal, Style "A" for acoustical tile, Style "B" for acoustical plaster, Style "K" for non-acoustical plaster, and Style "M" elsewhere, 24" square unless otherwise noted on the drawings. Access doors in 1 or 2-hour construction shall be Milcor or equal U/L "B" label doors.
- B. Air diffusers, grilles, and registers:
 - 1. Provide opposed blade damper volume controls only where specifically scheduled on the drawings.

2. Contractor to verify that the mounting frame of ceiling diffusers, grilles, and registers matches the ceiling or wall system actually being installed. Color to be standard off-white.
3. All air diffusers, grilles, and registers are to be as shown on the drawings.
4. Manufacturer: Titus, Price, or equal.

2.2 EQUIPMENT

A. VRF system - Mitsubishi:

1. General:
 - a. System description:
 - 1) The VRF system shall be a Mitsubishi Electric CITY MULTI Variable Refrigerant Flow (VRF) system or equal. The CITY MULTI VRF systems shall be the R2-Series (simultaneous cooling and heating) split system heat pump.
 - 2) The R2-Series system shall consist of a PURY outdoor unit, Branch Circuit (BC) Controller, multiple indoor fan coil units, and M-NET Direct Digital Controls (DDC). Each indoor unit or group of indoor units shall be capable of operating in any mode independently of other indoor units or groups. System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. To ensure power comfort, each indoor unit or group of indoor units shall be independently controlled and capable of changing mode automatically when zone temperature strays 1.8 degrees F from set point for ten minutes. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of outdoor rated capacity.
 - b. Quality assurance:
 - 1) The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label.
 - 2) All wiring shall be in accordance with the National Electrical Code (N.E.C.).
 - 3) The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
 - 4) All units must meet or exceed the 2010 Federal minimum efficiency requirements and the proposed ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the DOE alternative test procedure, which is based on the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standards 340/360, 1230 and ISO Standard 13256-1.
 - 5) A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.
 - c. Delivery, storage and handling:
 - 1) Unit shall be stored and handled according to the manufacturer's recommendation.
 - d. Warranty:
 - 1) The units shall be covered by the manufacturer's extended limited warranty for a period of five (5) years from date of installation.
 - 2) The refrigeration compressors shall have a manufacturer's limited warranty for a period of seven (7) years from date of installation. If, during this period, any part should fail to function properly due to defects

in workmanship or material, it shall be replaced or repaired at no cost to the Owner.

e. Qualifications of installer:

- 1) The CITY MULTI VRF system shall be installed by a Mitsubishi authorized CITY MULTI Diamond Dealer with extensive CITY MULTI installation and service training with a minimum of two (2) installations completed of similar size and complexity to this project. The mandatory Contractor service and install training shall be performed by the manufacturer. The installing Contractor shall submit proof of participating in and successfully completing the manufacturer's training program prior to ordering any equipment or proceeding with any work on this project. The installing Contractor must also submit a list of the CITY MULTI VRF systems that they have installed.

f. Manufacturer start-up services:

- 1) An authorized representative of the VRF system manufacturer is to inspect the installation and control functioning of the variable refrigerant flow system and provide start-up services. The representative is to provide a letter certifying that the installation meets their requirements and that the variable refrigerant flow system is fully operational.

2. VRF outdoor units - Mitsubishi:

a. General:

- 1) The VRF outdoor units shall be Mitsubishi PURY R-2 series or equal and shall be used specifically with CITY MULTI VRF components. The PURY outdoor units shall be equipped with multiple circuit boards that interface to the M-NET controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.
 - a) All units requiring a factory supplied twinning kit shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the Contractor.
 - b) Outdoor unit shall have a sound rating no higher than 60 dB(A) individually or 63 dB(A) twinned. Units shall have a sound rating no higher than 50 dB(A) individually or 53 dB(A) twinned while in night mode operation. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the Contractor.
 - c) Both refrigerant lines from the outdoor unit to the BC (Branch Circuit) Controller (Single or Main) shall be insulated.
 - d) There shall be no more than 3 branch circuit controllers connected to any one outdoor unit.
 - e) Outdoor unit shall be able to connect to up to 50 indoor units depending upon model.
 - f) The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
 - g) The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.
 - h) The outdoor unit shall have the ability to operate with a maximum height difference of 164 feet and have total refrigerant tubing length of 1804-2625 feet. The greatest length is not to exceed 541 feet between outdoor unit and the indoor units without the need for line size changes or traps.
 - i) The outdoor unit shall be capable of operating in heating mode down to -4°F ambient temperature or cooling mode down to 23°F

ambient temperature, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the Contractor.

- j) The outdoor unit shall be provided with a manufacturer supplied 20 gauge hot dipped galvanized snow/hail guard. The snow/hail guard protects the outdoor coil surfaces from hail damage and snow build-up in severe climates.
 - k) The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.
 - l) Unit must defrost all circuits simultaneously in order to resume full heating more quickly. Partial defrost which may extend "no or reduced heating" periods shall not be allowed.
- b. Unit cabinet:
- 1) The casing(s) shall be fabricated of galvanized steel, bonderized and finished.
- c. Fan:
- 1) Each outdoor unit module shall be furnished with one direct drive, variable speed propeller type fan. The fan shall be factory set for operation under 0 in. WG external static pressure, but capable of normal operation under a maximum of 0.24 in. WG external static pressure via dipswitch.
 - 2) All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
 - 3) All fan motors shall be mounted for quiet operation.
 - 4) All fans shall be provided with a raised guard to prevent contact with moving parts.
 - 5) The outdoor unit shall have vertical discharge airflow.
- d. Refrigerant:
- 1) R410A refrigerant shall be required for PURY outdoor unit systems.
 - 2) Polyester (POE) oil shall be required. Prior to bidding, manufacturers using alternate oil types shall submit Material Safety Data Sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.
- e. Coil:
- 1) The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
 - 2) The coil fins shall have a factory applied corrosion resistant blue-fin finish.
 - 3) The coil shall be protected with an integral metal guard.
 - 4) Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
 - 5) The outdoor coil shall include 4 circuits with two position valves for each circuit, except for the last stage.
- f. Compressor:
- 1) Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non inverter-driven compressors shall not be allowed.
 - 2) A crankcase heater(s) shall be factory mounted on the compressor(s).
 - 3) The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 19%-8% of rated capacity, depending upon unit size.

- 4) The compressor will be equipped with an internal thermal overload.
 - 5) The compressor shall be mounted to avoid the transmission of vibration.
 - 6) Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.
- g. Electrical:
- 1) The outdoor unit shall be controlled by integral microprocessors.
 - 2) The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.
3. VRF BC controllers - Mitsubishi:
- a. General:
- 1) The BC Controllers shall include multiple branches to allow simultaneous heating and cooling by allowing either hot gas refrigerant to flow to indoor unit(s) for heating or subcooled liquid refrigerant to flow to indoor unit(s) for cooling. Refrigerant used for cooling must always be subcooled for optimal indoor unit LEV performance; alternate branch devices with no subcooling risk bubbles in liquid supplied to LEV and are not allowed.
 - 2) The BC Controllers shall be specifically used with R410A R2-Series systems. These units shall be equipped with a circuit board that interfaces to the M-NET controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The BC Controller shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors, with access and service clearance provided for each controller. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of rated capacity.
 - 3) Each VRF system shall include at least one (1) unused branches or branch devices for future use. Branches shall be fully installed & wired in central location with capped service shutoff valve & service port.
- b. BC controller cabinet:
- 1) The casing shall be fabricated of galvanized steel.
 - 2) Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.
 - 3) The unit shall house two tube-in-tube heat exchangers.
- c. Refrigerant:
- 1) R410A refrigerant shall be required.
- d. Refrigerant valves:
- 1) The unit shall be furnished with multiple branch circuits which can individually accommodate up to 54,000 BTUH and up to three indoor units. Branches may be twinned to allow more than 54,000 BTUH.
 - 2) Each branch shall have multiple two-position valves to control refrigerant flow.
 - 3) Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.
 - 4) Linear electronic expansion valves shall be used to control the variable refrigerant flow.
- e. Integral drain pan:
- 1) An integral condensate pan and drain shall be provided.

- f. Electrical:
 - 1) The BC Controller shall be controlled by integral microprocessors.
 - 2) The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.
- 4. VRF fan coil units – Mitsubishi:
 - a. PLFY (Recessed ceiling 4-way) indoor unit:
 - 1) General:
 - a) The PLFY shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
 - 2) Unit cabinet:
 - a) The cabinet shall be a compact 22-7/16" wide x 22-7/16" deep so it will fit within a standard 24" square suspended ceiling grid.
 - b) The cabinet panel shall have provisions for a field installed filtered outside air intake.
 - c) Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.
 - 3) Fan:
 - a) The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
 - b) The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearing.
 - c) The indoor fan shall consist of three (3) speeds, Low, Mid, and High.
 - d) The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
 - e) The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution.
 - 4) Filter:
 - a) Return air shall be filtered by means of a long-life washable filter.
 - 5) Coil:
 - a) The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
 - b) The tubing shall have inner grooves for high efficiency heat exchange.
 - c) All tube joints shall be brazed with phos-copper or silver alloy.
 - d) The coils shall be pressure tested at the factory.
 - e) A condensate pan and drain shall be provided under the coil.
 - f) The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 19-3/4" inches above the condensate pan.
 - g) Both refrigerant lines to the PLFY indoor units shall be insulated.
 - 6) Electrical:
 - a) The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
 - b) The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
 - 7) Controls:

- a) Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
- b) Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F - 9.0°F adjustable deadband from set point.
- c) Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
- d) Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.
- e) Manufacturer to provide drain pan level sensor powered by a 20-year life lithium battery. Sensor shall require no external power for operation and shall have an audible indication of low battery condition.
- f) The drain pan sensor shall provide protection against drain pan overflow by sensing a high condensate level in the drain pan. Should this occur the control shuts down the indoor unit before an overflow can occur. A thermistor error code will be produced should the sensor activate indicating a fault which must be resolved before the unit re-starts.

5. VRF controls – Mitsubishi:

a. General:

- 1) The CITY MULTI Controls Network (CMCN) shall be capable of supporting remote controllers, schedule timers, system controllers, centralized controllers, an integrated web based interface, graphical user workstation, and system integration to Energy Management and Temperature Control System (EMTCS) via BACnet® interface.

b. Electrical characteristics

1) General:

- a) The CMCN shall operate at 30VDC. Controller power and communications shall be via a common non-polar communications bus.

2) Wiring:

- a) Control wiring shall be installed in a daisy chain configuration from indoor unit to ME remote controller to indoor unit, to the BC controller (main and subs, if applicable) and to the outdoor unit. Control wiring to remote controllers shall be run from the indoor unit terminal block to the controller associated with that unit.
- b) Control wiring for the remote controllers shall be from the remote controller to the first associated indoor unit (TB-5) M-NET connection. The smart ME remote controllers shall be assigned an M-NET address.
- c) Control wiring for centralized controllers shall be installed in a daisy chain configuration from outdoor unit to outdoor unit, to the system controllers (centralized controllers and/or integrated web based interface), to the power supply.
- d) The AE-200, AE-50, and EB-50GU centralized controller shall be capable of being networked with other AE-200, AE-50 and EB-50GU centralized controllers for centralized control.

3) Wiring type:

- a) Wiring shall be 2-conductor (16 AWG), twisted shielded pair, stranded wire, as defined by the Design Tool AutoCAD output.
- b) Network wiring shall be CAT-5 with RJ-45 connection.

- c. CITY MULTI controls network:
 - 1) The CITY MULTI controls network (CMCN) consists of remote controllers, centralized controllers, and/or integrated web based interface communicating over a high-speed communication bus. The CMCN shall support operation monitoring, scheduling, occupancy, online maintenance support, and integration with EMTCS using BACnet® interfaces.
- d. CMCN remote controllers:
 - 1) Smart ME remote controller (PAR-U01MEDU):
 - a) The Smart ME remote controller (PAR-U01MEDU) shall be capable of controlling up to 16 indoor units (defined as 1 group). The Smart ME remote controller shall control the following grouped operations: On/Off, Operation Mode (cool, heat, auto, dry, fan and setback, temperature set point, fan speed setting, and airflow direction setting). The Smart ME remote controller shall support timer settings of on/off/temperature up to 8 times in a day in 5-minute increments. The Smart ME remote controller shall support an Auto Off timer. The Smart ME remote controller shall be able to limit the set temperature range from the Smart ME remote controller, or via a PC through a licensed EB-50GU. The temperature range can be set from a touch screen panel on the TC-24. The room temperature shall be sensed at either the Smart ME remote controller or the indoor unit dependent on the indoor unit dipswitch setting. The Smart ME remote controller shall display a four-digit error code in the event of system abnormality or error. The ME remote controller shall incorporate manual addressing using rotary dial switch to the M-NET communication bus. The ME remote controller shall connect using two-wire, stranded, non-polar control wire to the indoor unit.
- e. Input/Output (I/O) boards:
 - 1) Advanced HVAC controller (AHC):
 - a) The AHC shall be capable of providing programmable binary and analog inputs and outputs to control general equipment in conjunction with indoor unit functions and states. Input and output states and values shall be monitored through the EB-50GU or the Smart ME Remote controller. The Smart ME remote controller shall be able to adjust temperature and humidity set points for equipment controlled by the AHC. In addition to analog and binary inputs the AHC shall monitor M-NET equipment states and sensor values. Available inputs include room temperature, room humidity, occupancy, brightness, outdoor temperature, inlet/outlet water temperature (PWFY), on/off state, mode, ventilation on/off, error status. In addition to programmable analog and binary outputs, the AHC shall be capable of control of indoor unit on/off, mode, temperature set point, fan speed, heat recovery unit on/off and heat recovery unit fan speed.
 - 2) Digital Input Digital Output (DIDO) board:
 - a) The DIDO board shall be capable of providing On/Off control for non-Mitsubishi Electric equipment via the EB-50GU Centralized Controller's licensed web browser functions, the interlock function of the EB-50GU and the TG-2000 software. Each DIDO board shall have two digital inputs and two digital outputs. Each digital output shall be capable of supporting an independent schedule via the EB-50GU Centralized Controller's web browser functions and the TG-2000 software. Status indication of the On/Off state of the non-Mitsubishi Electric equipment shall be either via the

- On/Off status of the digital output or by receipt of a digital input to the DIDO board.
- b) The DIDO board shall be capable of receiving a digital input for interlock settings with the CITY MULTI indoor units or digital outputs on the DIDO board. Based on the digital input status the DIDO board shall be capable of setting the following parameter on the indoor unit On/Off, Mode, and Set Temperature to predefined settings. The DIDO board shall also be capable of interlocking the On/Off state of a digital output on the DIDO board based on an onboard channel digital input status or a free contact input status from system indoor units.
- 3) Analog Input (AI) board:
- a) The AI board shall be capable of monitoring temperature or humidity via the EB-50GU Centralized Controller's web browser functions and the TG-2000 software. Each AI board shall have two analog inputs. Each input shall be capable of receiving a 4/20mA, 0/10 VDC, or 1/5 VDC signal for monitoring temperature or humidity. The AI board shall be capable of monitoring the temperature or humidity input and shall be capable of displaying graphical trending of the temperature or humidity values via the EB-50GU Centralized Controller's web browser functions and the TG-2000 software. Notification of user adjustable high and low level alarms shall be capable of being emailed to distribution list or outputted via a digital output.
 - b) The AI board shall be capable of setting the following parameters on the indoor unit On/Off, Mode, and Set Temperature to predefined settings based on the input value of the temperature or humidity. The AI board shall also be capable of interlocking the On/Off state of a digital output on the input value of the temperature or humidity.
- f. Centralized controller (Web-enabled):
- 1) AE200E touchscreen centralized controller:
 - a) The AE200E touchscreen centralized controller shall be capable of controlling a maximum of 50 indoor units across multiple outdoor units. The AE200E touchscreen centralized controller shall be powered from the external power supply (PAC-SC51KUA). The AE200E touchscreen centralized controller shall support system configuration, daily/weekly scheduling, monitoring of operation status, night setback settings, free contact interlock configuration and malfunction monitoring. The AE200E touchscreen centralized controller shall have five basic operation controls which can be applied to an individual indoor unit, a group of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic set of operation controls for the AE200E touchscreen centralized controller shall include on/off, operation mode selection (cool, heat, auto (R2/WR2-Series only), dry, setback (R2/WR2-Series only) and fan), temperature setting, fan speed setting, and airflow direction setting. Since the AE200E provides centralized control it shall be able to enable or disable operation of local remote controllers. In terms of scheduling, the AE200E touchscreen centralized controller shall allow the user to define both daily and weekly schedules with operations consisting of ON/OFF, mode selection, temperature setting, air flow (vane) direction, fan speed, and permit/prohibit of remote controllers.
 - b) All AE200E touchscreen centralized controllers shall be equipped with one RJ-45 Ethernet port to support interconnection with a network PC via a closed/direct Local Area Network (LAN).The

AE200E touchscreen centralized controller shall be capable of performing initial settings via a PC using the AE200E touchscreen centralized controller's initial setting browser.

- c) Standard software functions shall be available so that the building manager can securely log into each AE200E via the PC's web browser to support operation monitoring, scheduling, error email, interlocking and online maintenance diagnostics. Standard software functions shall not expire.

g. Graphical user workstation software:

- 1) The Graphical user workstation software (TG-2000) shall require a field supplied PC.
- 2) TG-2000 software:
 - a) The TG-2000 integrated system software shall enable the user to control multiple AE200E's. The TG-2000 configured computer shall be capable of controlling up to forty AE200E centralized controllers with a maximum of 2,000 indoor units across multiple outdoor units. The TG-2000 software shall be required to simultaneously control more than 1 AE-200/AE-50/AE200E centralized controllers from a single PC using a single software session. Licensing per function, per AE200E centralized controller shall be required for the TG-2000 software.

h. CMCN system integration:

- 1) The CMCN shall be capable of supporting integration with EMTCS.
- 2) The Mitsubishi BACnet® interface, BAC-HD150, shall be compliant with BACnet® Protocol (ANSI/ASHRAE 135-2004) and be Certified by the (BTL) BACnet® Testing Laboratories. The BACnet® interface shall support BACnet Broadcast Management (BBMD). The BACnet® interface shall support a maximum of 50 indoor units. Operation and monitoring points include, but are not limited to, on/off, operation mode, fan speed, prohibit remote controller, filter sign reset, alarm state, error code, and error address.xSIBe xSILb.

B. Cabinet supply fans:

- 1. Greenheck Series CSP or equal in-line cabinet fan. Verify that the air delivery capabilities, fan wheel size, and motor horsepower meet those listed for the Greenheck fans scheduled.
- 2. Fan is to be complete with insulated housing, motor, direct drive and factory hanging vibration isolators.
- 3. Provide all options and accessories as scheduled on the drawings.

C. Cabinet exhaust fan:

- 1. Greenheck Series CSP or equal direct drive exhaust fan.
- 2. Verify that the air delivery capabilities, fan wheel size, and motor horsepower meet those listed for the Greenheck fan scheduled.
- 3. Fan to be complete with insulated housing, motor, direct drive and factory hanging vibration isolators.
- 4. Provide all options and accessories as scheduled on the drawings.

D. Gravity hoods:

- 1. Greenheck Fabrahood, or equal gravity roof hoods.

2. Precision formed, arched panels with interlocking seams. Curb cap to be 8" larger than throat size. 1/2" galvanized steel mesh mounted horizontally across the intake/discharge area of the hood. Galvanized steel support members fasten so that hood can either be completely removed from the base or hinged open.
3. Provide all options and accessories as scheduled on the drawings.

2.3 SYSTEMS

A. Air distribution duct systems:

1. Duct and fittings:

- a. 2,500 fpm, +2.0" SP to – 2.0" SP for supply return, exhaust, transfer and outside air intake ducts.
- b. General: Ductwork shall be round spiral lock seam or rectangular galvanized steel construction.
- c. Duct construction:
 - 1) General: Construction shall be in accordance with the latest ASHRAE Standards, SMACNA 1995 - Second Edition with Addendum No. 1 November 1997 HVAC Duct Construction Standards, California State Mechanical Code, and the Title 24 energy standards.
 - 2) All duct joints and seams are to be constructed to meet the requirements of the 1995 SMACNA HVAC Duct Construction Standards noted above. Manufactured joints, such as Ductmate or TDC, are to be installed in strict accordance with the manufacturer's installation requirements.
 - 3) Care shall be taken to ensure that all duct reinforcing requirements are met.
 - 4) All 90° branch fittings for round ducts are to be of the conical tee type, conical saddle tap, or as detailed on the drawings.
 - 5) All spiral round duct and fittings inside buildings to be United McGill, Uni-Seal, or equal.
 - 6) Spiral duct joints for diameters up to 36" are to be fabricated using sleeve type couplings. Galvanized steel "Uni-Rings" or angle iron rings are to be used for joints on ducts 36" diameter and larger.
 - 7) Commercial gauge adjustable elbows may be used in concealed areas for duct sizes up through 14" diameter. For duct sizes greater than 14" diameter and where duct is exposed, elbows shall be United McGill "Uni-Seal" gored elbows or equal.
 - 8) All spiral round duct shall be installed in strict accordance with the manufacturer's requirements.
 - 9) All rectangular duct, fittings and plenums are to be constructed in accordance with 1995 SMACNA, HVAC Duct Construction Standards noted above.
 - 10) Provide galvanized steel angle ring, 2" wide at all locations where exposed ducts penetrate walls. Angle rings are to be installed to present a finished and aesthetically pleasing appearance.
 - 11) All exposed duct, fittings, sealants and apparatus are to be installed suitable for painting.
 - 12) All elbows and bends are to be made with the minimum inside radius equal to 1.5 times the duct diameter or centerline radius ($R/W=1.5$), where possible. If field conditions do not allow 1.5 inside radius, provide elbow and bend radius as long as possible. Elbow and bend radius shall be no less than that shown on the drawings. All conditions with

less than 1.5 inside radius must be approved by the Engineer, prior to fabrication and/or installation.

- 13) Non-radius, square heel and throat rectangular elbows, with or without turning vanes, are not acceptable unless specifically shown on the drawings.
- 14) All radius elbows in rectangular ductwork are to include one (1) splitter vane, located at a distance of 1/3 of the duct width as measured in from the elbow throat.

- d. Ducts are to be sealed so as to conform to SMACNA Duct Seal Class C. Duct tape as a sealant is not acceptable. A brush applied, high pressure duct sealant is to be utilized, MEI or equal. Sealant is to be verified that it is suitable for painting. Sealant is to be applied in a neat manner in exposed duct locations. Duct sealant is to be applied in complete accordance with the manufacturer's application instructions.
- e. Flexible Duct – Atco #036, R6.0, reinforced metalized polyester vapor barrier; or equal pre-insulated flexible duct may be used for final connection between ducts, grilles, and diffusers where shown on the drawings. Maximum length of flexible duct to be six (6) feet. Duct is to be carefully supported to provide smooth air flow path and to prevent sagging. Flexible duct must meet UL 181, Class 1, factory made, air duct requirements, California State Fire Marshall Approved. Install in strict accordance with manufacturer's installation instructions. Duct insulation is to be a minimum of 1-1/2" thick, 3/4 pounds per cubic foot density. Flexible duct is to have mounting collars. Joints of flexible ducts with other ducts or registers are to be made with sheet metal screws.
- f. All roof-mounted duct and/or ducts exposed to weather are to be constructed using roll-formed flanges with corner angles, gasket and cleats. Ductmate, TDC, TDF, or equal.

2. General:

- a. Access doors: Doors in sheet metal ducts and plenums for access to dampers, extractors and equipment shall be No. 18 gauge, and made airtight by means of felt strips. Doors shall be sized as required for reasonable service access. Minimum size shall be 12" x 12" unless limited by duct size.
 - 1) Fabricate in accordance with SMACNA Duct Construction Standards and as indicated.
 - 2) Review locations prior to fabrications.
 - 3) Fabricate rigid and close-fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum 1 inch thick insulation with metal cover.
 - 4) Access doors smaller than 12 inches square may be secured with sash locks.
 - 5) Provide 2 hinges and 2 sash locks for sizes up to 18 inches square, 3 hinges and 2 compression latches with outside and inside handles for sizes up to 24 x 18 inches.
 - 6) Access doors with sheet metal screw fasteners are not acceptable.
- b. Balancing dampers: Shall be furnished and installed where required to completely balance and otherwise adjust the air quantities to each supply and return outlet, branch duct and exhaust grille. Manual balance dampers shall be provided in each branch duct. Balancing dampers shall not be installed in the collar of any flexible duct.
 - 1) Balancing dampers in rectangular ducts:
 - a) Ruskin Model CD50 or equal low leakage damper with airfoil type extruded aluminum blade with a maximum depth of 6" and with an integral structural reinforcing tube running full length of each

blade. Blade edge seals shall be extruded vinyl double edge design with inflatable pocket. Linkage shall be concealed in frame damper manufacturer's literature shall include performance data developed from testing in accordance with AMCA Standard 500 in an AMCA approved laboratory showing pressure drop for all sizes of dampers required at all anticipated airflow rates.

- 2) Balancing dampers in round ducts:
 - a) Fabricate in accordance with SMACNA Duct Construction Standards and as indicated.
 - b) Shall be furnished and installed where required to completely balance and otherwise adjust the air quantities to all supply and return outlets, branch ducts, and exhaust grilles. Manual balance dampers shall be provided in each branch duct. Damper to be one gauge heavier than the duct gauge. Provide Jiffy Bearings JB-1 damper hardware or equal.
 - c) Except in round ductwork 12 inch and smaller, provide end bearings. On multiple blade dampers, provide oil impregnated nylon or sintered bronze bearings.
 - d) On insulated ducts, mount quadrant regulators on stand-off mounting brackets, bases or adaptors.

- c. Painting: Paint the inside of all backs of diffusers, registers, grilles, ducts and dampers extending as far as visible with flat black paint.
- d. Flexible connections for supply and return air ducts connections to the fan coil units and exhaust fans, and at all seismic building joints shall be 16 oz. airtight "Ventglass" or equal non-combustible fabric with fire retardant neoprene coating on outside. Attach to ductwork by lock seam. Install 6" long. Provide sheet metal rain cover over flexible connections exposed to the weather.
- e. Ducts exposed to the weather are to be completely weatherproofed. All joints and seams are to be sealed using Hardcast Galva-Grip or equal weatherproof duct sealant. The manufacturer's installation instructions are to be followed closely.
- f. Duct test holes: Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Refrigerant piping:

1. Refrigerant piping is to be pre-manufactured and insulated linesets, Mitsubishi Diamondback Linesets or equal.
2. Each refrigerant piping lineset is to be of the pipe sizes required by the VRF system manufacturer.
3. Each refrigerant piping lineset is to be provided in the length required. Linesets with length beyond what is required will not be accepted.

C. Mechanical systems and equipment insulation:

1. Ductwork:

a. General:

- 1) Adhesives and insulation materials: Composite fire and smoke hazard ratings maximum 25 for Flame Spread and 50 for Smoke Developed. Adhesives to be waterproof.

- 2) Anti-microbial agent surface coating: EPA-registered biocide, ASTM C-1338, ASTM G-21, ASTM G-22.
 - b. Insulation shall be provided on all ductwork where shown on the drawings, and all concealed supply, return and outside air intake ductwork.
 - c. Concealed ductwork: Cover all sides with 1-1/2 inch thick, 3/4 pounds per cubic foot density duct wrap with foil scrimkraft or equal, applied per the manufacturer's application specification. Note that foil scrimkraft is not required to be sealed as a vapor barrier. Johns Manville Microlite XG formaldehyde-free Type 75 FSK, Certainteed SoftTouch Type 75 FSK, or equal.
2. Piping and equipment:
- a. General: Adhesives and insulation materials: Composite fire and smoke hazard ratings of maximum 25 for Flame Spread and 50 for Smoke Developed. Adhesives to be waterproof.
 - b. Refrigerant piping:
 - 1) Jackets:
 - a) Indoor refrigerant piping:
 - i. Refrigerant piping insulation installed indoors shall have PVC jacketing on all elbows.
 - b) Outdoor refrigerant piping:
 - i. Pipe: Apply aluminum metal jacket, 0.016 inch thick, with moisture barrier around pipe and slip edge into preformed Z lock position to shed water. Butt next jacket section leaving approximately 3/8 inch gap. Place preformed 2 inch butt strap with sealant over the seam and secure with 1/2 inch aluminum band and wing seal.
 - ii. Fittings: Apply prefabricated metal fitting covers identical in composition to pipe jacketing.
 - iii. Minimum size of aluminum jacketing available is 3 inch. Where refrigerant piping with insulation is smaller than 3 inch, 3 inch aluminum jacketing and 3 inch prefabricated metal fitting covers are to be used.
- D. Supports and anchors:
1. Supports and anchors are to be as shown on the drawings. If supports and anchors are not shown on the drawings the following applies:
 2. Hanger rods: Steel, threaded both ends, threaded one end, or continuous threaded.
 3. Flashing:
 - a. Follow the roof manufacturer's recommendations for all roof penetrations, curbs, platforms, and sleepers.
- E. Sleeves:
1. Sleeves for pipes through nonfire rated floors: Form with 18 gauge galvanized steel.
 2. Sleeves for pipes through nonfire rated beams, walls, footings, and potentially wet floors: Form with steel pipe or 18 gauge, 1.2 mm thick galvanized steel.
 3. Sleeves for pipes through fire rated and fire resistive floors and walls, and fireproofing: Prefabricated fire rated sleeves, including seals, UL Listed.

4. Sleeves for round ductwork: Form with galvanized steel.
 5. Sleeves for rectangular ductwork: Form with galvanized steel or wood.
 6. Stuffing fire stopping insulation: Glass fiber type, noncombustible.
 7. Caulk: Acrylic sealant.
- F. Vibration isolation:
1. Refer to the drawings for vibration isolation requirements.
 2. Vibration isolation is to be Mason Industries or equal.
- G. Mechanical identification:
1. Piping, duct, valves and damper identification shall be manufactured by Marking Services, Incorporated or equal.
 2. Materials:
 - a. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.
 - b. Plastic nameplates: Laminated 3-layer plastic with engraved black 2 inch letters on light contrasting background color.
 - c. Metal tags: Brass aluminum with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
 - d. Plastic pipe markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.
- H. Testing, adjusting, and balancing:
1. Scope includes but is not limited to:
 - a. Testing, adjustment, and balancing of air systems.
 - b. Testing, adjustment, and balancing of hydronic systems.
 - c. Measurement of final operating condition of HVAC systems.
 2. References:
 - a. AABC: National standards for field measurement and instrumentation, total system balance.
 - b. ASHRAE: Systems handbook: Testing, adjusting, and balancing.
 - c. NEBB: Procedural standards for testing, balancing, and adjusting of environmental systems.
 3. Submittals:
 - a. Submit name of adjusting and balancing agency for approval.
 - b. Pre-construction plan

- 1) The testing, adjusting and balancing Contractor is to submit a plan at least two (2) weeks prior to the commencement of testing, adjusting and balancing work which includes the following:
 - a) A complete set of report forms intended for use on the project, with all data filled in except for the field readings. Forms to be project specific.
 - b) Marked up shop drawings identifying all HVAC equipment to be balanced, and associated outlets and terminal devices.
 - c) Identification of the type, manufacturer, and model of actual instruments to be used, and clear indication of which instrument will be used to take each type of reading. Calibration certs to be included.
 - d) A narrative of any project specific and/or non-standard testing, adjusting and balancing procedures to be used, and the equipment or systems they apply to.
 - c. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets and indicating thermostat locations.
4. Report forms:
- a. Submit reports on AABC National Standards for Total System Balance or NEBB forms.
 - b. Forms shall include the following information:
 - 1) Title page:
 - a) Company name
 - b) Company address
 - c) Company telephone number
 - d) Project name
 - e) Project location
 - f) Project engineer
 - g) Project engineer
 - h) Project Contractor
 - i) Project altitude
 - 2) Instrument list:
 - a) Instrument
 - b) Manufacturer
 - c) Model
 - d) Serial number
 - e) Range
 - f) Calibration date
 - 3) Air moving equipment:
 - a) Location
 - b) Manufacturer
 - c) Model
 - d) Air flow, specified and actual
 - e) Return air flow, specified and actual
 - f) Outside air flow. specified and actual
 - g) Total static pressure (total external), specified and actual
 - h) Inlet pressure
 - i) Discharge pressure
 - j) Fan RPM
 - 4) Electric motors:
 - a) Manufacturer
 - b) HP/BHP
 - c) Phase, voltage, amperage; nameplate, actual, no load.

- d) RPM
 - e) Service factor
 - f) Starter size, rating, heater elements
 - 5) Supply fan data:
 - a) Location
 - b) Manufacturer
 - c) Model
 - d) Air flow, specified and actual
 - e) Total static pressure (total external), design and actual
 - f) Actual inlet pressure
 - g) Actual discharge pressure
 - h) Fan RPM
 - 6) Cabinet exhaust fan data:
 - a) Location
 - b) Manufacturer
 - c) Model
 - d) Air flow, design and actual
 - e) Total external static pressure, design and actual
 - f) Actual inlet pressure
 - g) Actual discharge pressure
 - h) Fan RPM
5. Air balance tolerances:
- a. Air balance shall be made with least possible friction.
 - b. Allowances shall be made for air filter resistance at the time of the tests. The main air supplies shall be at design air quantity with pressure drop across the air filter bank at simulated dirty condition.
 - c. Air balance tolerances:
 - 1) Outside air: The outside air setting is to be plus 5%, minus 5% from the design air quantity.
6. Project record documents:
- a. Comply with Division 1 requirements.
 - b. Accurately record actual locations of flow measuring stations and balancing valves and rough setting.
7. Quality assurance:
- a. Agency shall be company specializing in the adjusting and balancing of systems specified with a minimum of 3 years experience. Perform work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing, and Adjusting Supervisor.
 - b. Total system balance shall be performed in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance, ASHRAE Systems Handbook, or NEBB Procedural Standards for Testing, Balancing, and Adjusting of Environmental Systems.
 - c. Schedule and sequence work to ensure completion of work before substantial completion of Project.
8. Schedule and sequence work to ensure completion of work before substantial completion of project.

9. Agencies: The following agencies are acceptable for this Project: National Air Balance, Mechanical Environmental Systems (MESA), or equal.
10. Examination:
 - a. Before commencing work, verify that systems are complete and operable. Ensure the following:
 - 1) Equipment is operable and in a safe and normal condition.
 - 2) Control systems are installed complete and operable.
 - 3) Proper thermal overload protection is in place for electrical equipment.
 - 4) Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5) Duct systems are clean of debris.
 - 6) Correct fan rotation.
 - 7) Volume dampers are in place and open.
 - 8) Coil fins have been cleaned and combed.
 - 9) Access doors are closed and duct end caps are in place.
 - 10) Air outlets are installed and connected.
 - 11) Duct system leakage has been minimized.
 - 12) Report any defects or deficiencies noted during performance of service to the engineer.
 - 13) Promptly report abnormal conditions in mechanical systems or conditions which prevent system balance.
 - 14) If, for design reasons, system cannot be properly balanced, report as soon as observed.
 - 15) Beginning of work means acceptance of existing conditions.
11. Preparation:
 - a. Provide instruments required for testing, adjusting, and balancing operations.
 - b. Provide additional balancing devices as required.
12. Adjusting:
 - a. Recorded data shall represent actually measured or observed condition.
 - b. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
 - c. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
 - d. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
 - e. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Owner's Representative.
13. Air system procedure:
 - a. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at all locations.
 - b. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

- c. Measure air quantities at air inlets and outlets.
- d. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- e. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- f. Vary total system air quantities by adjustment of fan speeds. Install drive changes as required. Vary branch air quantities by damper regulation.
- g. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- h. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- i. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- j. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

PART 3 - EXECUTION

3.1 GENERAL

- A. For the actual fabrication, installation, and testing of work under this section, use only thoroughly trained and experienced workmen who are properly qualified for the work they perform. All installers are to be completely familiar with the manufacturer's current recommended methods of installation and shall so execute.

3.2 EQUIPMENT

- A. All equipment is to be installed to meet the manufacturer's installation instructions, guidelines, and recommendations.

3.3 SPECIAL REQUIREMENTS

- A. During construction meet or exceed all requirements of ASHRAE standard 62.1-2013 Chapter 7, Construction and System Start-up.
- B. Provide temporary construction ventilation. Continuously ventilate during installation of materials that emit volatile organic compounds (VOC) and after installation until emissions dissipate including, but not limited to, applications of adhesives, paints, floor coatings, stains and varnishes. Exhaust areas to outside the buildings; do not transfer air to other enclosed spaces. If continuous ventilation is not possible using the building's HVAC system, then ventilate using operable windows and temporary fans that have the capacity to provide a minimum of three (3) air changes per hour in the area requiring ventilation.
- C. All fans in the HVAC system are to be turned off and all supply and return openings are to be sealed from dust and debris infiltration during dust producing activities such as drywall installation, sanding, sweeping or blowing, carpet installation, etc.

- D. Allow products that have odors and significant VOC emissions to off-gas in dry, well-ventilated space for a sufficient period to dissipate odors and emissions prior to delivery to the construction site. Condition products without containers and packaging to maximize off-gassing of VOCs. Condition products in a ventilated warehouse or other building.
- E. Where odorous and/or high VOC-emitting products are applied on-site, apply them prior to installation of porous and fibrous materials including foams.
- F. Vacuum carpeted and other accessible surfaces (use a certified vacuum or HEPA vacuum that meets or exceeds the CRI Seal of Approval/Green Label Vacuum Cleaner Program criteria for vacuum cleaning performance) after construction is complete and prior to occupancy.
- G. Oil film on sheet metal shall be removed before shipment to site. On-site, inspect ducts to confirm that no oil film is present and remove any oil that is present. If ducts contain dust and dirt, clean them immediately, prior to substantial completion and prior to using the ducts to circulate air. HVAC system components or duct work may only be cleaned, coated, or have applied to its surface disinfectants, pesticides or biocides that are registered and particularly labeled for use in HVAC systems by state and federal EPA.

3.4 REFRIGERANT PIPING INSTALLATION

- A. Install refrigerant piping linesets in complete accordance with the lineset manufacturer's installation instructions and the installation instructions of the manufacturer's of the equipment served by each refrigerant piping lineset.
- B. Refrigerant piping is to be run straight without sags.
- C. Outdoor refrigerant piping is to be run with adequate space between pipes to allow 0.016 inch thick aluminum jacketing to be installed.
- D. Refrigerant charge is to meet with the manufacturer's installation instructions.
- E. Horizontal refrigerant piping is to be installed to run level.

3.5 DUCT AND ACCESSORIES

- A. Installation:
 - 1. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
 - 2. Connect terminal units to main supply air with galvanized steel duct.
 - 3. Connect diffusers to low pressure ducts in concealed locations with 5 feet maximum length of flexible duct. Hold in place with strap or clamp to prevent duct from collapsing above diffuser.
 - 4. Provide balancing dampers at points on supply, return, exhaust, and outside air systems where branches are taken from larger ducts as required for air balancing.
 - 5. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.
 - 6. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire/smoke dampers, and elsewhere as indicated.

Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated.

7. Provide duct test holes where indicated and required for testing and balancing purposes.
8. Check location of outlets and inlets and make necessary adjustments in position to conform with Architectural features, symmetry, and lighting arrangement.
9. Install diffusers to ductwork with airtight connection.
10. Paint ductwork visible behind air outlets and inlets matte black.

3.6 MECHANICAL SYSTEM AND EQUIPMENT INSULATION

A. General:

1. Install all insulation, including duct liner, in strict accordance with the manufacturer's installation instructions and specifications.

B. Ductwork:

1. Do not install covering before ductwork and equipment has been tested, and accepted by the Architect.
2. Ensure surface is clean and dry prior to installation. Ensure insulation is dry before and during application.
3. Ensure insulation in continuous through inside walls. Pack around ducts with fireproof, self-supporting insulation material, properly sealed.
4. Finish insulation neatly at hangers, supports, and other protrusions.
5. Repair separation of joints or cracking of insulation due to thermal movement or poor workmanship.

C. Refrigerant piping:

1. General:

- a. Install materials after piping has been tested, and accepted by Architect.
- b. Insulation shall be provided all gas and liquid piping for VRF systems.

2. Jackets:

a. Indoor refrigerant piping:

- 1) Install PVC jacketing on all elbows in accordance with the manufacturer's installation instructions.

b. Outdoor refrigerant piping:

- 1) Apply 0.016 inch aluminum metal jacket with moisture barrier around pipe and prefabricated metal fitting covers in accordance with the manufacturer's installation instructions.
- 2) Aluminum jacketing and prefabricated metal fitting covers are to be installed in a professional and aesthetically pleasing manner.

3.7 MECHANICAL IDENTIFICATION

A. Installation:

1. Degrease and clean surfaces to receive adhesive for identification materials.
2. Plastic nameplates: Install with corrosive-resistant mechanical fasteners or adhesive.
3. Plastic or metal tags: Install with corrosive-resistant chain.
4. Plastic pipe markers: Install in accordance with manufacturer's instructions.
5. Equipment: Identify all equipment with plastic nameplates. Small devices may be identified with plastic metal tags.
6. Controls: Identify control panels and major control components' outside panels with plastic nameplates.
7. Valves: Identify valves in main and branch piping with tags.
8. Piping: Identify piping, concealed or exposed, with plastic pipe markers. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Location of identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.
9. Balancing Dampers: Identify all balancing dampers in concealed areas with fluorescent colored plastic flagging tape, min. 1-3/16" wide. Tape to be long enough so that it can be seen from the access location.
10. Provide valve chart and schedule in aluminum frame with clear plastic shield. Install at location as directed.

3.8 SUPPORTS AND ANCHORS

A. Fabrication:

1. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
2. Design hangers without disengagement of supported pipe.
3. Prime coat exposed steel hangers and supports per Section 05 50 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

B. Equipment bases and supports:

1. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Flashing:

1. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, and roofs in accordance with roofing manufacturer's recommendations.

2. Provide acoustical lead flashing around ducts and pipes penetrating building wall from roof-mounted equipment. Flashing to be installed in accordance with manufacturer's instructions for sound control.

D. Sleeves:

1. Where piping or ductwork penetrates ceiling or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk seal airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
2. Install steel escutcheons at finished surfaces.

3.9 TEMPERATURE CONTROL SYSTEM

- A. Install the temperature control system as described herein and as indicated on the drawings.
- B. All low voltage wiring (below 120 volt) is to be furnished and installed under this section of the specifications. Follow manufacturer's type and gauge of wire to meet requirements of field conditions and length of run. Install larger transformers as required.
- C. The Contractor shall be responsible for ensuring that all wiring (including the line voltage interlock wiring by the Electrical Contractor) is connected so as to provide the sequence of operation required. The Contractor shall provide the necessary information and supervision the Electrical Contractor.
- D. Calibrate all devices, make final settings and test the control system under operating conditions for satisfactory operation with the sequences of operation as shown on the drawings.
- E. The control system shall be guaranteed for a period of one (1) year from the date of acceptance against defects in workmanship and materials. Provide any service incidental to the proper performance of the temperature control systems under the guarantee.
- F. The Mechanical Contractor may perform all required temperature control functions in lieu of hiring an independent Temperature Control Contractor, provided the Contractor has the necessary experience and qualified personnel to handle the installation and provide the control adjustments, wiring and start-up/check-out required.

3.10 ELECTRICAL WORK

- A. The following electrical work is required to be provided and installed under Division 26:
 1. Motor starters and disconnect switches for all motors, except where specifically specified, to be furnished by the equipment manufacturer.
 2. Line voltage wiring and conduit to motors, motor starters, and disconnect switches.
 3. Line voltage wiring and conduit to switches as indicated on temperature control diagrams.
 4. Line voltage wiring and conduit for remote control of motors.
 5. Conduit only as required for low voltage temperature control system.

- B. If Contractor furnishes equipment requiring changes in electrical work, it shall be the responsibility of the Contractor to arrange and pay for such changes to result in no additional cost to the Owner.
- C. Contractor shall be responsible for checking electrical drawings and verifying actual voltage to be supplied before ordering equipment.
- D. Contractor shall provide for the complete installation of wiring and controls required for heating, ventilating, and air conditioning equipment, and shall be responsible for the proper operation of the complete system.

3.11 SUPPORTS AND ANCHORS

- A. Fabrication:
 - 1. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
 - 2. Design hangers without disengagement of supported pipe.
 - 3. Prime coat exposed steel hangers and supports per Section 05 50 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- B. Equipment bases and supports:
 - 1. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
- C. Flashing:
 - 1. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, and roofs in accordance with roofing manufacturer's recommendations.
 - 2. Provide acoustical lead flashing around ducts and pipes penetrating building wall from roof-mounted equipment. Flashing to be installed in accordance with manufacturer's instructions for sound control.
- D. Sleeves:
 - 1. Where piping or ductwork penetrates ceiling or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk seal airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
 - 2. Install steel escutcheons at finished surfaces.

3.12 SYSTEM TEST AND STARTUP

- A. Check the installation and connection requirements for conformance with the manufacturer's installation instructions for each piece of equipment.
- B. Perform the step-by-step checkout and startup procedures for each piece of equipment in accordance with the manufacturer's startup instructions.

- C. The Mechanical Contractor is to coordinate the efforts of the Test and Balance Contractor to ensure that all systems are tested and performing as intended.
- D. Make all necessary control and system adjustments and operate the system in its final configuration for a period of ten (10) working days for the purpose of proving satisfactory performance. During this period, instruct such persons as Owner may designate in proper operation, care, and maintenance of the systems.

3.13 ACCEPTANCE REQUIREMENTS

- A. The Contractor shall be responsible for the completion of all acceptance requirements in the 2016 California Building Energy Efficiency Standards (Title 24). Refer to Specification Section 23 05 00 for additional information on acceptance requirements.

END OF SECTION

SECTION 23 05 00

ACCEPTANCE REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. The General Conditions, Supplementary Conditions, and Division 1 General Requirements apply to the work specified in this Section.

1.2 SUMMARY

- A. Section Includes: The work shall consist of furnishing all labor, materials, and equipment required, including the cost and coordination necessary to engage a certified HERS rater if duct leakage testing is required, to complete the Mechanical Acceptance Requirements of the California Building Energy Efficiency Standards (2016) and submit the required forms. Work shall include, but not be limited to, the following principal items:
 - 1. Visual inspection of the equipment and installation.
 - 2. Review of the certification requirements.
 - 3. Functional tests of the systems and controls.
 - 4. Completion of the required forms and submission to the authority having jurisdiction.

1.3 RELATED WORK

- A. Heating, Ventilating and Air Conditioning Systems, Section 23 00 00.
- B. Electrical, Division 26.
- C. Plumbing Systems, Section 22 00 00.

1.4 GENERAL REQUIREMENTS

- A. All labor, material and testing apparatus required to complete the Acceptance Testing of the Heating, Ventilating and Air Conditioning (HVAC) systems to meet the 2016 Title 24 Acceptance Requirements are to be included as a part of this work. For additional information on the 2016 Title 24 testing acceptance requirements refer to www.energy.ca.gov/title24/2016_standards/.
- B. Verification of Conditions: Prior to beginning Acceptance Testing of the mechanical equipment, inspect all equipment and verify that equipment is properly installed and ready for operation.
- C. Codes: Work must comply with the Applicable Code Requirements.
- D. Reference Standards: Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to work of this Section where cited below:

1. Air Moving and Conditioning Association (AMCA).
2. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).
3. American Society of Mechanical Engineers (ASME).
4. American Society of Plumbing Engineers (ASPE).
5. Associated Air Balance Council (AABC).
6. National Electrical Manufacturers Association (NEMA).
7. National Fire Protection Association (NFPA).
8. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
9. California Building Code (CBC).
10. State of California - OSHA.
11. California Mechanical Code (CMC).
12. The State of California Codes and Safety Orders.
13. 2016 California Building Energy Efficiency Standards (Title 24).
14. State Fire Marshal requirements (SFM).
15. Air Conditioning and Refrigeration Institute (ARI).
16. State of California Environmental Quality Act.
17. American Society of Testing and Materials (ASTM).
18. Underwriters Laboratories (UL).
19. Occupational Safety and Health Act (OSHA).
20. National Bureau of Standards (NBS).
21. American National Standards Institute (ANSI).
22. AMCA Standard 99: Standards Handbook
23. AMCA/ANSI Standard 204: Balance Quality and Vibration Levels for Fans
24. AMCA Standard 210: Laboratory Methods of Testing Fans for Ratings
25. AMCA Standard 300: Reverberant Room Method for Sound Testing of Fans
26. AMCA Standard 500: Test Methods for Louvers, Dampers and Shutters
27. ARI Standard 410: Forced-Circulation Air-Cooling and Air-Heating Coil
28. ANSI/ASHRAE 15: Safety Code for Mechanical Refrigeration

29. ASHRAE Standard 52: Gravimetric and Dust Spot Procedures for Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter
30. ASHRAE/ANSI Standard 111: Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems
31. ASME Section VIII: Unified Pressure Vessel Code
32. UL Standard 1995: Heating and Cooling Equipment
33. ASTM A-525: Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
34. ASHRAE Standard 62.1-2013: Ventilation for Acceptable Indoor Air Quality.
35. ANSI/ASHRAE Standard 55-2013: Thermal Environmental Conditions for Human Occupancy.

1.5 ROLES AND RESPONSIBILITIES

- A. Acceptance testing, the completion of the Certificate of Acceptance forms and the submittal of the Certificate of Acceptance forms to the authority having jurisdiction are the responsibility of the installing Contractor. The responsible Contractor for the mechanical acceptance test requirements is as follows:
 1. Mechanical acceptance requirements: The mechanical acceptance test requirements and completion of the required Certificate of Acceptance forms are to be completed by the HVAC system installing Contractor.
- B. Individual acceptance tests may be performed by one or more Field Technicians under the responsible charge of the installing licensed Contractor (Responsible Person) eligible under Division 3 of the Business and Professions Code, in the applicable classification, to accept responsibility for the scope of work specified by the Certificate of Acceptance document. The Responsible Person must review the information on the Certificate of Acceptance form and sign the form to certify compliance with the acceptance requirements. The individuals who perform the field testing/verification work and provide the information required for completion of acceptance form (Field Technicians) are not required to be licensed Contractors. Only the Responsible Person who signs the Certificate of Acceptance form to certify compliance must be licensed.
- C. Field Technician: The Field Technician is responsible for performing and documenting the results of the acceptance procedures on the Certificate of Acceptance forms. The Field Technician must sign the Certificate of Acceptance to certify that the information he provides on the Certificate of Acceptance is true and correct. It is important to note that the Field Technician is not required to have a Contractor's license. A license is only required of the Responsible Person described below.
- D. Responsible Person: Each certificate of Acceptance must be signed by a licensed Responsible Person who is eligible under Division 3 of the Business and Professions code in the applicable classification, to take responsibility for the scope of work specified by the Certificate of Acceptance document. The Responsible Person can also perform the field testing and verification work, and if this is the case, the Responsible Person must complete and sign both the Field Technician's signature block and the Responsible Person's signature block on the Certificate of Acceptance form. The Responsible Person assumes responsibility of the acceptance testing work performed by his Field Technician agent or employee.

- E. The acceptance requirements process must address the following:
 - 1. Review the bid documents to make sure that sensor locations, devices and control sequences are properly documented.
 - 2. Review of the installation, and complete the required acceptance testing.
 - 3. Certify the acceptance test results on the Certificate of Acceptance, and submit the certificate to the enforcement agency prior to receiving a final occupancy permit.

1.6 SUBMITTALS

- A. At the completion of the acceptance testing and Certificate of Acceptance forms, the HVAC system installing Contractor is to submit their Certificate of Acceptance forms to the authority having jurisdiction with a copy to the Architect.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

- A. The Acceptance Agent is to provide the test equipment and the test materials required for performing the required acceptance testing.

2.2 FORMS AND PROCEDURES

- A. Refer to the 2016 Non-Residential Compliance Manual for the 2016 Building Energy Efficiency Standard for the complete list of acceptance tests and related Certificate of Acceptance forms that may be required.
- B. The actual acceptance tests required are shown on the Title 24 forms provided on the drawings.

PART 3 - EXECUTION

3.1 ACCEPTANCE TESTING PROCESS

- A. Overview:
 - 1. The acceptance requirements require the following four (4) major check-points to be conducted by the installing Contractor:
 - a. Plan review
 - b. Construction inspection
 - c. Functional testing and verification
 - d. Certificate of Occupancy
 - 2. Each of these four (4) major check-points are described in more detail below:
- B. Plan Review:

1. The installing Contractor responsible for certification of the acceptance testing/verification on the Certificate of Acceptance (Responsible Person) must review the plans and specifications to ensure that they conform to the acceptance requirements. This is typically done prior to signing a Certificate of Compliance.
2. The Title 24 documents will include code compliance forms which list the respective envelope and mechanical systems that will require acceptance tests, and the parties responsible for performing the tests.

C. Construction Inspection:

1. The installing Contractor responsible for certification of the acceptance testing/verification on the Certificate of Acceptance (Responsible Person) must perform a construction inspection prior to testing.
2. The purpose of the construction inspection is to assure that the equipment that is installed is capable of complying with the requirements of the Standards. Construction inspection also assures that the equipment is installed correctly and is calibrated.

D. Functional Testing:

1. A Field Technician must take responsibility for performing the required acceptance requirements procedures. All of the required acceptance tests for a project need not to be performed, the Field Technician who performs the test is responsible for identifying all performance deficiencies, ensuring that they are corrected, and if necessary, he must repeat the acceptance requirement procedures until the specified systems and equipment are performing in accordance with the acceptance requirements. The Field Technician who performs the testing must sign the Certificate of Acceptance to certify the information he has provided to document the results of the acceptance procedures is true and correct.
2. A licensed Contractor, who is eligible under Division 3 of the Business and Professions Code in the applicable classification, to take responsibility for the scope of work specified by the Certificate of Acceptance must review the test results from the acceptance requirement procedures provided by the Field Technician and sign the Certificate of Acceptance to certify compliance with the acceptance requirements. Regardless of who performs the tests, a Responsible Person must review the forms and sign off on them. The Responsible Person may also perform the Field Technician's responsibilities, and must then also sign the Field Technician declaration on the Certificate of Acceptance to certify that the information on the form is true and correct.

3.2 COMPLETION OF ACCEPTANCE TESTING

- A. The Acceptance Testing work will be complete when the HVAC system installing Contractor has completed the required acceptance tests and has completed the acceptance testing forms and completed and signed the Certificates of Acceptance for their installation and submitted this documentation to the authority having jurisdiction and to the Architect.

END OF SECTION

SECTION 26 00 00
ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish all labor, materials, apparatus, tools, equipment, transportation, temporary construction and special or occasional services as required to make a complete working electrical installation, as shown on the drawings or described in these Specifications. The work shall include materials, appliances and apparatus not specifically mentioned herein or noted on the drawings as being furnished and installed under another section.
- B. Work Included:
 - 1. Service and connections to motors and equipment furnished under other divisions.
 - 2. Overcurrent protective devices.
 - 3. Grounding.
 - 4. Incidental work and materials involved in installing the electrical equipment including, but not limited to, rigging, support hardware, temporary lighting and carpentry.
 - 5. Fire-stopping.
 - 6. Compliance with all applicable codes.
 - 7. Testing.
 - 8. Seismic bracing and structural calculations for anchoring and bracing of installed equipment.
 - 9. Project record drawings.
 - 10. Electrical permit(s).

1.2 RELATED SECTIONS

- A. Consult all other sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete, finished and workmanlike installation.
- B. Perform the following work, in accordance with the appropriate sections of the specifications as necessary to furnish a complete, working electrical installation.
 - 1. Moisture protection: Include sheet metal flashing, counter flashing, caulking and sealants as required for waterproofing of conduit penetrations through walls, and roofs. All leaks caused by this contractor's work shall be repaired at no additional cost to the owner.
 - 2. Miscellaneous metal work: Include fittings, brackets, supports, rods, welding and pipe as required for support and bracing of raceways, lighting fixtures, panel etc.

3. Mechanical Equipment: Provide power wiring, fused disconnect switches and electrical connections for all mechanical equipment. Refer to the mechanical drawings for additional requirements. All electrical power (including 120V control power) and interfacing relays and other devices shown on those drawings as being furnished by the electrical contractor shall be included in the pricing. Provide roof receptacles as required by code. Roof receptacles shall be ground fault with built-in test and reset.
4. Equipment furnished under other contracts requiring electrical power and connections: Information regarding power and control connections is shown on the electrical drawings. It is the contractor's responsibility to obtain a set of vendor's installation drawings and coordinate the details of the electrical installation with them.

1.3 DEFINITIONS

Furnish:	Purchase and deliver to jobsite in new condition.
Install:	Receive and store at jobsite until required; place, secure and connect; provide appurtenances.
Provide:	Furnish and install as defined above.
Section:	Refers to a section of these specifications.
NEC:	National Electrical Code.
NETA:	International Electrical Testing Association.
Contractor:	Electrical Contractor.
Commissioning:	Complete system testing and debugging. After commissioning the system under test shall be fully operational and ready to turn over to the owner.

1.4 SEISMIC BRACING

- A. All major electrical components including, but not limited to, conduit racks and panel board shall be anchored and braced to conform to the International Building Code.

1.5 QUALITY ASSURANCE

- A. Materials and Systems:
 1. Labels: Provide materials listed and labeled by Underwriters' Laboratories or testing firm acceptable to authority having jurisdiction, where listing service is normally provided for product.
 2. Materials:
 - a. Provide new and ship to jobsite in original manufacturer's containers or bundles. Materials and equipment for which tests have been established by Underwriters Laboratories, Inc. shall bear its label of approval or the label of an OSHA approved nationally recognized testing laboratory [NRTL].
 - b. The materials to be furnished shall be the standard products of manufacturers regularly engaged in the production of such equipment equal to or superior to material specified, and shall be the manufacturer's latest standard design that complies with the Specification requirements.
- B. Workmanship: Arrange work to as required for a coordinated installation.
- C. Code Compliance: Comply with applicable codes, laws, rules, regulations, and standards of applicable code-enforcing authorities.

- D. References and Standards: All materials and equipment shall comply with all applicable standards and requirements of the standards listed below. Nothing in the Drawings or Specifications shall be construed to permit Work not conforming to applicable laws, ordinances, rules, regulations. It is not the intent of Drawings or Specifications to repeat requirements of codes except where necessary for completeness or clarity.
1. Underwriters' Laboratories, Inc. (UL).
 2. American National Standards Institute (ANSI).
 3. Institute of Electrical and Electronics Engineers (IEEE).
 4. National Electrical Code (NEC) (as currently adopted by the AHJ).
 5. International Building Code (IBC).
 6. Standard for Electrical Safety in the Work Place (NFPA-70E, 2009 Edition).
 7. National Electrical Manufacturer's Association (NEMA).
 8. National Fire Protection Association (NFPA).
 9. NETA Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
 10. State of California Energy Regulations.
- E. If the Drawings or Specifications are not clear, the Subcontractor shall issue a Request for Information (RFI) for an interpretation and decision prior to proceeding with the Work.
- F. Manufacturer's Directions: Follow manufacturer's directions for specific equipment installation requirements. Manufacturer's directions do not take precedence over the drawings and specifications and where these are in conflict notify the Architect for clarification prior to proceeding with the work.
- G. Protection of Equipment:
1. Care shall be exercised during construction to avoid damage to equipment. Equipment shall be protected from dust and moisture prior to and during construction.
 2. Where required or directed, construct temporary protection for equipment and installations so as to protect same from dust and debris caused by construction.
 3. The Subcontractor shall repair by spray or brush painting, after properly preparing the surface, scratches or defects in the finish of the equipment. Only identical paint furnished by the equipment manufacturer shall be used.
 4. Failure of the Subcontractor to protect the equipment as outlined herein shall be grounds for rejection of the equipment and its installation.
- H. Qualifications and License Requirements:
1. The subcontractor performing electrical construction work on the project shall have an Electrical Construction License from the State of California.
 2. The Subcontractor performing electrical construction work shall have sufficient experience in this type of construction.

3. Certified electricians shall have evidence of certification in their possession at all times. Non-certified personnel shall perform electrical work under the continuous supervision of a certified electrician.

1.6 SUBMITTALS

- A. A complete list of materials and equipment proposed shall be submitted for approval. The list shall include for each item: the manufacturer, the manufacturer's catalog number, type or class, rating, capacity, size, etc.
- B. Submittals shall include, but not be limited to, manufacturer's product literature, dimensioned drawings, one-line drawings and performance data as necessary to verify compliance to specification requirements.
- C. Submit product information for supplied products for approval.
 1. Overcurrent protection devices.
 2. Fused disconnect switches.
 3. Conduits.
 4. Conductors.

1.7 SUBSTITUTION

- A. The manufacturer's equipment described on the drawings and listed first in the specification is the basis of the design. Where manufacturers of generally comparable products are listed, these are substitute items subject to proof of acceptability.
- B. No resubmittal of substitute items shall be allowed. If a substitute item is rejected, the contractor shall provide the specified item.
- C. Installation of approved substituted equipment is the Subcontractor's responsibility, and changes required to work included under other divisions for installations of approved substituted equipment must be made to the satisfaction of the Architect-Engineer and without change in contract price. Approval by the Architect-Engineer of substituted equipment and/or dimension drawings does not waive these requirements.

1.8 SUPERVISION

- A. The contractor shall personally or through an authorized and competent representative constantly supervise the work from beginning to completion and, within reason, keep the same workmen and foreman on the project throughout the project duration.

1.9 PROTECTION

- A. Keep conduits, junction boxes and outlet boxes and other openings closed to prevent entry of foreign matter; cover fixtures, equipment and apparatus; protect against dirt, paint, water, chemical, or mechanical damage before and during construction period. Restore to original condition any fixture, apparatus, or equipment damaged prior to final acceptance, including restoration of damaged shop coats of paint, before final acceptance. Protect bright finished surfaces and similar items until in service. No rust or damage will be permitted.

1.10 SITE INVESTIGATION

- A. The contractor acknowledges that he has investigated and satisfied himself as to the conditions affecting his work including reviewing the site electrical drawings. No allowance shall be subsequently made for any extra expense incurred due to failure or neglect to determine conditions affecting the work.

1.11 WARRANTY OF CONSTRUCTION

- A. The contractor warrants that the work performed under this contract conforms to the contract requirements and is free of any defects of equipment, materials or design furnished, or workmanship by the contractor or any of his subcontractors or suppliers.
- B. Such warranty shall continue for a period of one year from the date of final acceptance of the work. Under this warranty the contractor shall remedy, at his own expense, any such failure or defect in the system.
- C. Manufacturer's guarantees or warranties still in effect shall be given to the owner at the expiration of the guarantee period specified above.

1.12 SAFETY AND INDEMNITY

- A. The contractor shall be responsible for implementing, maintaining and supervising all necessary safety precautions which will insure against injury to persons or damage to property as a result of any of his work, tools or equipment on or off the project, before, during or after normal working hours. No drawing review, construction review or any other act or services rendered by the owner, engineer, their employees or consultants shall be construed to approve or judge upon the adequacy of the contractor's safety measures.
- B. The contractor shall hold harmless, indemnify and defend the owner, engineer, their employees and consultants from any and all liability claims, losses or damage arising or alleged to arise from the performance of the work described herein, but not including the sole negligence of the owner, engineer, their employees or consultants.

1.13 PROJECT RECORD DRAWINGS

- A. Prepare complete record drawings showing actual installed locations and sizes of equipment, fixtures, devices, feeders, branch circuits and empty conduit runs and a complete and accurate single-line diagram of the electrical work as installed.
- B. Project record drawings shall be prepared in AutoCAD R2010 or later version format.
- C. Submit a compact disk (with all electronic files) to the owner.

1.14 TEMPORARY FACILITIES

- A. Provide all required temporary facilities for proper performance of the contract. All such temporary facilities shall be located where directed and maintained in a safe and sanitary condition at all times until completion of the contract; then removed from the site and disposed of as directed.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All the materials shall be new, of the quality herein specified, free from defects and listed by the Underwriter's Laboratories for the purpose for which they are used. Materials shall be of uniform type and make throughout the building.

2.2 CONDUIT:

A. Rigid Steel Conduit:

1. Conduit, Rigid steel: Full weight, threaded, hot-dip galvanized, inside enameled, conforming to ANSI C80.1.
2. Three piece couplings: Electroplated, cast malleable iron. Efcor 165 Series. OZ/Gedney 4-50 series or approved equal.
3. Insulated Grounding Bushings: Threaded cast malleable iron body with insulated throat and steel "lay-in" ground lug with compression screw. OZ/Gedney BLG series. Thomas & Betts 3870 series or approved equal.
4. Insulated Metallic Bushings: Threaded cast malleable, iron body with plastic insulated throat rated 150 degrees C, OZ/Gedney tupe B, Thomas & Betts 1222 series or approved equal.

B. Electrical Metallic Tubing (EMT):

1. Conduit: Shall be formed of cold rolled strip steel, electrical resistance welded continuously along the longitudinal seam and hot dip galvanized after fabrication. Conduit shall conform to ANSI C80.3 specifications and shall meet UL requirements.
2. Couplings: Electroplated, steel, set-screw type, UL listed concrete tight in dry locations; electroplated, steel, watertight compression type (with compression ring), UL listed concrete tight in damp and wet locations. Efcor or approved equal.
3. Connectors: Electroplated, steel, set-screw type, UL listed concrete tight with insulated plastic throat, 150 degree C temperature rated; electroplated, steel, watertight compression type (with compression ring), UL listed concrete tight with insulated plastic throat, 150 degree C temperature rated in damp and wet locations. Efcor or approved equal.

C. Rigid Non-metallic Conduit (PVC):

1. Rigid Polyvinylchloride conduit, schedule 40, conforming to NEMA TC2, latest edition. UL listed for exposed and direct-burial applications and for 90 degree C conductor insulation.
2. Fittings: Couplings, adapters, transition fittings, etc., shall be molded PVC, slip on, solvent weld type.
3. Manufacturer: Carlon Type 40 – heavy wall rigid PV-duit or approved equal.

D. Liquid tight Flexible Metallic Conduit:

1. Conduit: Anaconda Type UA, Coleman Type UXTL or approved equal.
2. Fittings: Connector body and gland nut shall be of cadmium plated cast malleable iron, with tapered, male, threaded hub; insulated throat and neoprene "O" ring gasket recessed into the face of the stop nut. The clamping gland shall be of molded nylon with an integral brass push-in ferrule.

2.3 OUTLET AND PULL BOXES

- A. Dry Locations: Galvanized, one-piece, pressed steel; Steel City, Raco, Efcor.
- B. Pull Boxes: Fabricated from Code-gauge galvanized steel, painted grey.

2.4 WIRE AND CABLE

- A. Deliver to the site in unbroken containers or reels, all secondary cable single conductors, 600 volt rating, with UL label.
- B. All conductors shall be copper; Minimum size is #12.
- C. Conductors #6 and smaller shall be color coded.
- D. Wire type shall be XHHW, 90 degrees C, for feeders, type THWN, 90 degrees C, for branch circuits in dry locations and type RHH, THHN or THWN, 90 degrees C, for wire installed in fixtures raceways.
- E. Color coding shall be in accordance with the requirements of the local inspection authorities.

2.5 WIRE TERMINATIONS AND SPLICING DEVICES

- A. Splices in wires and cables #10 and smaller shall be made with approved type solderless connectors, Scotchlok or equal. In no case shall insulation of joint be of less insulation value than corresponding insulation of the wires.
- B. Wire splicing devices shall be mechanical set-screw type with flexible insulating cover, captive pressure screws and self-closing openings. They shall be UL 486B listed for 600V and shall be rated for copper conductors. IlSCO "Nimbus" or equal.

2.6 HANGERS AND SUPPORTS:

- A. Construction channel: 14 gauge, plated steel, Superstrut, Unistrut.
- B. General: Properly support all material, equipment and apparatus.
- C. Concrete Inserts: No. 452 or C-302 for new construction. Phillips Red Head or self-drilled anchors.
- D. Exposed Metallic Conduits: Support at intervals of not more than 10'.
- E. Conduit Supports: Pipe clamps with inserts for concrete, machine screws for metal surfaces and wood screws for wood construction or suitable trapeze supports.
- F. Miscellaneous Steel: Provide miscellaneous steel members, beams, brackets, etc., for support of work in this Division unless specifically included in other Divisions.

2.7 OVERCURRENT PROTECTION DEVICES

- A. Molded Case Branch and Feeder Circuit Breakers:
 - 1. Breakers shall be molded case, bolt-on, trip indicating, thermal magnetic type ambient temperature compensated.

2. Circuit breakers shall have interrupting capacity not less than shown on the drawings, or if not shown, not less than 14,000 RMS symmetrical amps for 480 volt systems and 10,000 RMS symmetrical amps for 208 volt systems. Series ratings may be used to obtain ratings between feeder and branch circuit breakers only.
3. Covers shall be sealed on non-interchangeable trip breakers to prevent tampering. Circuit breaker ratings shall be clearly visible after installation, or engraved nameplates shall be provided stating the rating. All ferrous parts shall be plated to minimize corrosion.
4. Breakers shall have toggle, quick-make and quick-break operating mechanisms with trip-free feature to prevent contacts being held closed against over-current conditions in the circuit. Trip position of the breakers shall be clearly indicated by operating handles moving to a center position.
5. Each pole of the circuit breakers shall have a thermal magnetic trip element, each pole being individually calibrated. Multiple breakers shall have a single handle to open and close all contact simultaneously in both manual operation and under automatic tripping. Interpole barriers shall be provided inside the breaker to prevent any phase-to-phase flash over. Each pole of the breakers shall have means of arc extinction.
6. Circuit breaker frame 250A and larger shall be provided with adjustable instantaneous.
7. Circuit breakers shall have UL label and shall conform to the requirements of the National Electrical Manufacturers' Association Publication AB-1-1975.
8. Fuses: All power fuses shall be current limiting type. Unless otherwise shown on the plans, types of fuses shall be Shawmut or equal class RK-1 Rejection type fuses.

2.8 DISCONNECT SWITCHES:

- A. Switches shall be NEMA heavy duty type with dead front construction with provisions for fuses and for padlocking the handle in the off position.
- B. Switches shall have a quick-make quick-break, position indicating, operating handle and mechanism and a dual cover interlock to prevent unauthorized opening of the switch door in the "ON" position.

Manufacturer: Square D, Eaton, General Electric or approved equal.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. All workmanship shall be of highest quality, done by persons especially skilled at assigned tasks, and shall result in neat installation consistent with best practices of trades.
- B. Install work uniform, level and plumb in relationship to lines of building. Do not install any exposed diagonal, or otherwise irregular work unless approved by the County representative.

3.2 COORDINATION WITH OTHER TRADES:

- A. The contract drawings are diagrammatic and indicate the approximate location of outlets and materials unless dimensions are shown. follow the drawings as closely as possible.

- B. Examine the contract drawings to logically locate work in coordination with construction features such as beams, furring, door swings, ducts, and pipes.

3.3 CUTTING AND PATCHING:

- A The electrical contractor shall obtain approval before performing any cutting or patching of concrete, steel, masonry, or wood structure in the buildings

3.4 CONDUIT

- A. Conduits shall be installed in a workmanlike manner and shall conform to best of modern practice. All conduits shall be installed with code radius bends. Where more than two 90 degree bends are required, pull boxes shall be installed. Conduits shall be tightly corked and shall be otherwise well protected during construction. All branch circuit conduits shall be blown out and swabbed before wires are pulled. All conduit ends shall be reamed after cutting. A heavy nylon cord shall be installed in all empty conduits or ducts.
- B. Conduits shall be concealed in spaces provided, unless otherwise specifically shown. If spaces are inadequate, the School representative shall be notified in time to avoid unnecessary work. All conduit runs exposed to view shall be installed parallel or at right angles to structural members, wall of lines of the buildings.
- C. In long runs of conduit, provide sufficient pull boxes to facilitate pulling wires and cables. Support pull boxes from structure independent of conduit supports. Spacing of pull boxes shall not exceed 100 feet. Pull boxes are not necessarily shown on the plans.
- D. Uses:
 - 1. EMT: For feeders and power and lighting branch circuits run exposed or concealed above ceilings and in walls.
 - 2. Rigid steel: Exterior exposed and for all turn-ups through floor slabs.
 - 3. Liquidtight flexible metallic conduit: For all connections to air conditioning equipment and motors located in wet or damp areas.
 - 4. PVC schedule 40: Underground for power.
- E. Where conduits cross corridor walls, through electrical or mechanical room walls, they shall be neatly firestopped. Fire sealing shall be done using approved compounds and methods.

3.5 INSTALLATION OF WIRE AND CABLE

- A. No wires shall be pulled into any portions of conduit system until all construction work which might damage the wire has been completed. No mechanical means shall be used to pull wires without obtaining permission from the school representative. All wires shall be continuous from outlet to outlet, or from terminal to terminal. No splices shall be permitted in the conduit.
- B. Splices in wires and cables shall be made with approved type solderless, crimped connector kits. In no case shall insulation of joint be of less insulation value than corresponding insulation of the wires.

3.6 INSTALLATION OF BOXES AND WIRING DEVICES:

- A. General:

1. All outlets shall finish flush with building walls, ceilings and floors except where exposed work is called for.
 2. Install raised device covers (plaster rings) on all switch and receptacle outlets installed in stud walls; or in furred or suspended, walls or ceilings. Covers shall be of a depth to suit the wall or ceiling finish.
 3. Leave no unused openings in any box. Install close-up plugs as required to seal openings.
 4. Exposed outlet boxes and boxes in damp location or wet locations shall be cast metal with gasketed cast metal cover plates.
- B. Box Layout:
1. Outlet boxes shall be installed at the locations and elevations shown on the drawings or specified herein. Make adjustments to locations as required by structural conditions and to suit coordination requirements of other trades.
 2. Through-wall boxes shall not be permitted.
- C. Supports:
1. Boxes installed in metal stud walls shall be equipped with brackets designed for attaching directly to the studs or shall be mounted on heavy gauge, galvanized steel, snap-in box supports. Efcor MBS series, Steel City 5171 V series or equal.
- D. Wiring Devices and Device Plates:
1. Wall mounted straight blade, U-ground receptacles shall be installed with grounding slot at the bottom for vertical orientations and with grounding slot at left for horizontal orientations.
 2. Device plates shall be set with the vertical corner line plumb and with all edges of the plate in contact with the adjacent wall surfaces.
- E. Blank device plates shall be installed on all outlets in which no device is required is installed.

3.7 GROUNDING

- A. Except as otherwise noted, the complete electrical installation including neutral conductors, metallic conduits and raceways, boxes, cabinets and equipment shall be completely and effectively grounded in accordance with all code requirements, whether or not such connections are specifically shown or specified.
- B. An insulated, green copper ground conductor shall be installed in all power system raceways.
- C. Conduit terminating in concentric knockouts at panelboards, cabinets and gutters shall have grounding bushings and bonding jumpers installed interconnecting all such conduits and the panelboards, cabinets, gutter, etc.
- D. Terminate the equipment ground wires on an isolated ground bus provided in panelboards.
- E. Receptacle grounding: Connect the ground wire to the receptacle ground screw and to the box using two 6" green pigtails sliced to the ground wire

3.8 TESTING AND COMMISSIONING

- A. Required labor, equipment and materials shall be provided to perform specified tests. Tests must be successfully completed prior to and after energizing systems. Defects which are found during tests shall be corrected at no additional charge.
- B. Test all new feeders, circuits, control devices and motors for proper operation. Correct any malfunctions at no additional charge.

3.9 IDENTIFICATION AND LABELING

- A. Provide plastic engraved nameplates on all major pieces of equipment including, but not limited to each feeder circuit breaker and panelboards. Nameplates shall be black with 1/2" high white letters and shall clearly indicate the device or feeder name and, in the case of panelboards, the voltage.
- B. Provide a typewritten panelboard directory in each panelboard.
- C. Provide black lettering (3/16" high) on clear adhesive circuit markers ("Brother" or equal) identifying panel and circuit number on each receptacle and motor circuit. Markers shall be placed on the receptacle cover plates or on the outside of disconnect switches in dry locations and on the inside of disconnect switches in damp or wet locations.

3.10 WORKMANSHIP

- A. All workmanship shall be of highest quality, done by persons especially skilled at assigned tasks, and shall result in neat, clean and well done installation consistent with best practices of trades.
- B. Install work uniform, level and plumb in relationship to lines of building. Do not install any exposed diagonal, or otherwise irregular work unless specifically approved by the owner's representative.

3.11 CLEANING AND PROTECTION

- A. During progress of the work, keep premises reasonably free of debris, cuttings and waste material. Upon completion of work, and at other times as general contractor may direct, remove all such debris from premises.
- B. Interior of conduits and equipment shall be kept free of direct rubbish and other foreign materials during and after installation. Conduits and ducts shall be capped when work is stopped and for future use.
- C. Fixtures shall be protected from dirt, moisture and mechanical damage during and after installation. Damaged fixtures shall be restored to their original condition or shall be replaced at no additional cost to the owner.
- D. Upon completion of the work under this section, remove immediately all surplus materials, rubbish and equipment associated with or used in the performance of this work. Failure to perform such cleanup operations within 24 hours of notice by the general contractor shall be considered adequate grounds for having the work done by others at this contractor's expense.

3.12 PAINTING AND FINISHING

- A. Equipment shall be furnished with factory or field-applied coat and finish coat of enamel. Damaged finishes shall be restored to match original.

3.13 WATERPROOF CONSTRUCTION:

- A. Maintain waterproof integrity of all penetrations of materials intended to be waterproof. Flash all raceways extending through the roof with galvanized metal roof jacks and seal with approved sealants to make the flashing watertight. All leaks caused by this contractor's work shall be repaired at no additional cost to the owner.
- B. Equipment or devices mounted out-of-doors or otherwise exposed to the weather shall have NEMA Type 3R or better enclosures. Such installations shall be weatherproof.

3.14 CLEAN-UP

- A. Perform the work under this section so as to keep affected portions of the building and site neat, clean and orderly. Upon completion of the work under this section, remove immediately all surplus materials, rubbish and equipment associated with or used in the performance of this work. Failure to perform such cleanup operations within 24 hours of notice by the owner shall be considered adequate grounds for having the work done by others at this contractor's expense.

3.15 PROJECT CLOSEOUT

- A. The contractor shall notify the owner's representative in writing when the project is ready for final inspection for the purpose of determining the state of completion of the project. From the information gathered from this inspection, the owner's representative will prepare a "walk-through-summary" of work to be performed, corrected, or completed before the project will be accepted. All work on the walk-thru summary shall be completed within thirty (30) calendar days by the contractor prior to final inspection.
- B. Project record drawings and the operation and maintenance manuals shall be completed within 30 calendar days after the walk-through summary and shall be delivered to the owner's representative at that time. Provide four copies.
- C. Provide two hours of electrical system operation instruction and review with the owner's representative at the completion of the project.
- D. Submit "as-built" compact disk (with all electronic files) to the owner.
- E. Final payment will not be made until the project record drawings, the operation and maintenance manuals and the "as-built" drawings are received and accepted.

END OF SECTION

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.
- B. Refer to drawings for applicable codes.

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 NFPA 70, 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 NFPA 70.

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, NFPA 70, 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.
- 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 03 30 53 "Miscellaneous Cast-in-Place Concrete."
- B. Concrete: 3000-psi, 28-day compressive strength.

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. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

3.5 ELECTRICITY-METERING EQUIPMENT

- A. Install utility company metering equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.6 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 7 Section "Through-Penetration Firestop Systems."

3.7 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.

3.8 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.
- 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.

3.9 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

03/06/19

SECTION 26 05 13

CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- 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 NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

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. American Insulated Wire Corp.; a Leviton Company.
 - 2. General Cable Corporation.
 - 3. Senator Wire & Cable Company.
 - 4. 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. AFC Cable Systems, Inc.

2. AMP Incorporated/Tyco International.
 3. Hubbell/Anderson.
 4. O-Z/Gedney; EGS Electrical Group LLC.
 5. 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 cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Basic Electrical Materials and Methods."
- F. Seal around cables penetrating fire-rated elements according to Division 7 Section "Penetration Firestopping."

- 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

01/11/19

SECTION 26 05 33
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, wire ways 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 NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

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. Alflec 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. IMC: ANSI C80.6.

- D. EMT and Fittings: ANSI C80.3.
 - 1. Fittings: Set-screw or compression type.
- E. FMC: Aluminum.
- F. LFMC: Flexible steel conduit with PVC jacket.
- G. 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. Floor Boxes: Cast metal, fully adjustable, rectangular.
 - F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
 - G. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
 - H. 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.
 - I. 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.

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 CABLE TRAY

- A. Cable tray shall be aluminum, rung type, 24"W x 4"H, with rung spacing of 6", per NEMA VE 1 requirements.

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.
 - C. Minimum Raceway Size: 3/4-inch trade size.
 - D. Conduits used for fiber optic cable installation shall be provided with inner duct.
 - E. 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. 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.
- ### 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 26 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. Provide inner duct in conduit for all fiber optic cable installation.
- G. Provide flexible metal conduits for conduits installed inside cabinets.
- H. 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.
- I. 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.
- J. 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.
- K. 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.
- L. 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.
- M. Tighten set screws of threadless fittings with suitable tools.
- N. 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.

- O. 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.
- P. 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.
- Q. 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 NFPA 70.
- R. 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.
- S. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed 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.
- T. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- U. Set floor boxes level and flush with finished floor surface.
- V. Install hinged-cover enclosures and cabinets plumb. Support at each corner.
- W. Install cable tray in accordance with NEMA VE 2 requirements.

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

01/11/19

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Identification of electrical equipment and devices for all renovation and new building projects.

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 Identification of materials and method.
- C. Samples: One for each type of materials specified.

1.3 QUALITY ASSURANCE

- A. All identification material and methods, engraved labels, conductor numbers, branch circuit schedules, relay panel schedules, identification for circuit breakers and underground utility markers shall meet Code requirements and industry standards.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. For Engraved Labels: Lamicoid
- B. For Conductor Numbers: Brady
- C. For Underground Utilities Ribbon: Allen Systems, Inc.

2.2 IDENTIFICATION MATERIALS AND METHODS

- A. Coordinate names, abbreviations and other designations with equipment specified in this or other Divisions of the Specification or identified by the District.
- B. Conform to requirements of the CEC, latest adopted version with amendments by local AHJs including warning labeling and identification on existing equipment.
- C. Furnish products listed by UL or other testing firm acceptable to AHJ.

2.3 ENGRAVED LABELS

- A. Melamine plastic laminate, white with black core, 1/16-inch thick.
- B. Dymo tape labels are not acceptable.

2.4 CONDUCTOR NUMBERS

- A. Manufacturer's standard vinyl-cloth self-adhesive cable and conductor markers of the wraparound type. Preprinted black numbers on yellow field.

2.5 BRANCH CIRCUIT SCHEDULES

- A. Provide branch circuit identification schedules, typewritten, clearly filled out, to identify load connected to each circuit and location of load. Numbers to correspond to numbers assigned to each circuit breaker pole position.
- B. Provide two columns, odd numbers in left column, even numbers in right column, with 3-inch-wide line for typing connected load information.

2.6 RELAY PANEL SCHEDULES

- A. Provide typewritten schedule to identify the incoming circuit, the controlled load, and the controlling devices for each relay.

2.7 IDENTIFICATION FOR CIRCUIT NUMBERS:

- A. Provide permanent identification number in or on panelboard dead-front adjacent to each circuit breaker pole position. Square D adhesive is approved, other adhesives by specific prior approval only.
- B. Horizontal centerline of engraved numbers to correspond with centerline of circuit breaker pole position.
- C. Detectable plastic ribbon, 6-inch wide by 4 mil thick.

2.8 Underground utility markers:

- A. Color code as recommended by APWA. Safety Red for electric power distribution. Safety Alert Orange for telephone, signal, data and cable TV.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fasten labels to equipment in a secure and permanent manner.
- B. Mark underground utilities in conformance with APWA.
- C. Where signs are to be applied to surfaces which require finish, install identification after completion of painting.
- D. Engravers standard letter style, minimum 3/16-inch high capital letters.
- E. Drill or punch labels for mechanical fastening except where adhesive mounting is necessary because of substrate. Use self tapping stainless steel screws.
- F. Install an engraved label on each major unit of electrical equipment indicating both equipment name and circuit serving equipment (e.g. "EF-1, CKT. 2P1-1,3,5), including but not limited to the following items:
 - 1. Disconnect switches, identify item of equipment controlled.
 - 2. Relays.
 - 3. Contactors.
 - 4. Time switches.
 - 5. Override switches.
 - 6. Service disconnect and distribution switches, identify connected load.

7. Branch circuit panelboards.
 8. Central or master unit of each electrical system including communication/signal systems, unless the unit incorporates its own self-explanatory identification.
- G. Install engraved on the inside of flush panels, visible when door is opened. Install label on outside of surface panel.
 - H. Apply markers on each conductor for power, control, signaling and communications circuits where wires of more than one circuit are present.
 - I. Match conductor identification used in panelboards, shop drawings, contract documents and similar previously established identification for division 26 work.
 - J. Provide branch circuit identification schedules, typewritten, clearly filled out, to identify load connected to each circuit and location of load. Numbers to correspond to numbers assigned to each circuit breaker pole position.
 - K. Provide two columns, odd numbers in left column, even numbers in right column, with 3-inch-wide line for typing connected load information.
 - L. Provide typewritten schedule to identify the incoming circuit, the controlled load, and the controlling devices for each relay.
 1. Imprint over entire length of ribbon in permanent black letters, the system description, selected from manufacturer's standard legend which most accurately identifies the subgrade system.
 2. Install continuous tape, 6 to 8 inches below finish grade, for each exterior underground raceway.
 3. Where multiple small lines are buried in a common trench and do not exceed an overall width of 16 inches, install a single marker. Over 16 inch width of lines, install multiple tapes not over 10 inches apart (edge to edge) over the entire group of lines.

END OF SECTION

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SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Time switches.
 - 2. Photoelectric relays.
 - 3. Occupancy sensors.
 - 4. Multipole lighting relays.
 - 5. Multipole lighting contactors.
 - 6. Basic control contactor panels
 - 7. System clock
 - 8. Exterior photocell

1.2 SUBMITTALS

- A. Product Data: For each type of lighting control device indicated.
- B. Field quality-control test reports.
- C. Operation and maintenance data.
- D. Shop drawings: Submit dimensional drawings of all lighting control system components and accessories.
- E. Typical wiring diagram: Submit typical wiring diagrams for all components including, but not limited to, contactor panels, contactors, photocells, switches, occupancy sensors, and daylighting controls.

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 47 CFR 15, Subparts A and B, for Class A digital devices.
- 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. Contactors and Relays:

- a. Automatic Switch Co.
 - b. Challenger Electrical Equipment Corp.
 - c. Cutler-Hammer Products; Eaton Corporation.
 - d. Furnas Electric Co.
 - e. GE Lighting Controls.
 - f. Hubbell Lighting, Inc.
 - g. Siemens Energy and Automation, Inc.
 - h. Square D Co.; Power Management Organization.
 - i. Zenith Controls, Inc.
2. Time Switches:
- a. Diversified Electronics, Inc.
 - b. Grasslin Controls Corp.
 - c. Intermatic, Inc.
 - d. Leviton Manufacturing.
 - e. Paragon Electric Co., Inc.
 - f. Tork, Inc.
 - g. Zenith Controls, Inc.
 - h. Watt Stopper, Inc. (The).
3. Photoelectric Relays:
- a. Allen-Bradley/Rockwell Automation.
 - b. Area Lighting Research, Inc.
 - c. Fisher Pierce.
 - d. Grasslin Controls, Corp.
 - e. Intermatic, Inc.
 - f. Paragon Electric Co., Inc.
 - g. Rhodes, M H , Inc.
 - h. SSAC, Inc.
 - i. Tork, Inc.
4. Occupancy Sensors:
- a. Watt Stopper, Inc. (The).
 - b. Honeywell, Inc.; Home and Building Controls.
 - c. Hubbell Lighting, Inc.

- d. Lightolier.
 - e. Lithonia Control Systems.
 - f. MyTech Corporation.
 - g. Novitas, Inc.
 - h. RAB Electric Manufacturing Co., Inc.
5. Basic control contactor panels and associated accessories:
- a. Watt Stopper, Inc. (The).
 - b. Lithonia control systems
 - c. Leviton company Inc.
 - d. GE Industrial Systems; Total Lighting Control.

2.2 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

- A. Line-Voltage Surge Protection: Include in all 120- and 277-V solid-state equipment. Comply with UL 1449 and with ANSI C62.41 for Category A locations.

2.3 TIME SWITCHES

- A. Description: Solid-state programmable type with alphanumeric display complying with UL 917.
 - 1. Astronomic dial.
 - 2. Two contacts, rated 30 A at 277-V ac, unless otherwise indicated.
 - 3. Two pilot-duty contacts, rated 2 A at 240-V ac, unless otherwise indicated.
 - 4. Eight-day program uniquely programmable for each weekday and holidays.
 - 5. Skip-day mode.

2.4 PHOTOELECTRIC RELAYS

- A. Outdoor Sealed Units: Solid state, with single-pole, double-throw dry contacts rated to operate connected relay or contactor coils or microprocessor input, and complying with UL 773A Weathertight housing, resistant to high temperatures and equipped with sun-glare shield and ice preventer.
 - 1. Light-Level Monitoring Range: 0 to 3500 fc (0 to 37 673 lx), with an adjustment for turn-on/turn-off levels.
 - 2. Time Delay: Prevents false operation.

2.5 OCCUPANCY SENSORS

- A. Ceiling and Non-Switch-Box Mounting Units: Unit receives control power from a separately mounted auxiliary power and control unit, and operates power switching contacts in that unit in response to signals from sensors.
 - 1. Auxiliary Power and Control Units: Matched to sensors with which used. Features as follows:

- a. Relays rated for a minimum of 20-A normal ballast load or 13-A tungsten filament or high-inrush ballast load.
 - b. Sensor Power Supply: Rated to supply the number of connected sensors.
- B. Switch-Box-Mounting Units: Unit receives power directly from switch leg of the 120- or 277-V ac circuit it controls and operates integral power switching contacts rated 800 W at 120-V ac, and 1000 W at 277-V ac, minimum.
 - 1. Manual Override Switch: Turns lights on/off manually regardless of elapsed time delay.
- C. Operation: Turns lights on when room or covered area is occupied and off when unoccupied, unless otherwise indicated.
 - 1. Time Delay for Turning Lights Off: Adjustable over a range from 1 to 15 minutes, minimum.
 - 2. Ambient-Light-Level Control: Adjustable for setting a level of ambient illumination above which sensor will not turn lights on when occupancy is sensed.
- D. Passive-Infrared Type: Detects occupancy by a combination of heat and movement in zone of coverage. Each sensor detects occupancy anywhere in an area of 1000 sq. ft. (93 sq. m) by detecting occurrence of 6-inch (150-mm) minimum movement of any portion of a human body that presents a minimum target of 36 sq. in. (232 sq. cm) to the sensor.
- E. Ultrasonic Type: Emits a beam of ultrasonic energy and detects occupancy through use of Doppler's principle in discerning movement in zone of coverage by sensing a change in pattern of reflected ultrasonic energy.
- F. Dual-Technology Type: Uses a combination of passive-infrared and ultrasonic detection methods to distinguish between occupied and unoccupied conditions for area covered. Particular technology or combination of technologies that controls each function (on or off) is selectable in the field by operating controls on unit.
- G. Unless otherwise noted, provide dual-technology type occupancy sensors where shown.

2.6 MULTIPOLE CONTACTORS AND RELAYS

- A. Description: Electrically operated and mechanically held, and complying with UL 508 and NEMA ICS 2.
 - 1. Listed Current Rating for Switching: Consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballasts with 15 percent or less total harmonic distortion of normal load current).
 - 2. Control Coil Voltage: Match control power source.

2.7 BASIC CONTROL CONTACTOR PANELS

- A. Description: Shall be UL listed and consist of following:
 - 1. Tub: Empty NEMA 1 enclosure that can accept an interior sized to accept up to 16, 32, or 64 contactor poles.
 - 2. Cover: Surface or Flush as required, with captive screws in a hinged, lockable configuration.
 - 3. Interior: Metal back plate and barrier for separation of high voltage (class 1) and low voltage (class 2) wiring. Intelligence board with eight channels of control provided

regardless of interior size. Interiors shall be provided with up to 16, 32, or 64 DIN rail mounted contactor poles.

B. Features:

1. Contactors shall be DIN rail mounted, four pole, normally closed, electrically held with coil voltage to match panel control power voltage. Contactors shall be compatible with all lighting, ballast and HID loads and be rated for 20 Amp tungsten up to 277V and rated for 30 Amp ballast and general use up to 600V. Provide 20% spare contactor poles.
2. Eight automatic control channels for operating contactors controlling exterior and/or interior lighting. Each channel shall be individually configurable to meet project needs. Each channel shall include an LED light status indicator to provide channel status and a separate ON/OFF/Auto switch for manual channel control.
3. Clock port for connection to an optional system clock. When a system clock is installed, eight override inputs are activated providing logic control of the eight channels from external photocells, switches, occupancy sensors, timers, daylighting controllers, etc.
4. Expansion terminals shall be provided for low voltage wiring connection between main and expansion panels in a multiple panel system. All automatic channel operation in the designated main panel (panel with the system clock), shall signal expansion panels' corresponding channels to operate.
5. Auxiliary power for operating optional system devices provides 350mA at 24VDC and 350mA at 24VAC power.

2.8 SYSTEM CLOCK

A. Description:

1. The system time clock shall be installed in the main or central panel of a multiple panel system or in each panel when individual panel time control is desired. The system clock shall provide time-based control with eight year time back-up, non-volatile memory program storage, automatic daylight savings adjustment, selectable 12/24 hour time formats and selectable date formats. All clock programming shall be accessible from the clock front display/keypad.

B. Features:

1. Control of eight control channels shall be available on the clock. Provide status and manual ON/OFF control of each channel from the front display and keypad.
2. The clock shall have control of eight individual override inputs, which can be used to connect external devices such as photocells, switches and daylighting controllers. Each of these inputs can be configured to operate as a photocell, as an ON/Auto switch, as a maintained ON/OFF switch, or as a momentary ON/OFF switch.
3. Schedules shall be assigned to any combination of days of the week and/or 3 holiday day types. Other scheduling features shall include:
 - a. Temporary schedules: schedules that execute on an assigned day then automatically delete themselves from memory.
 - b. Repeating schedules: repeat a schedule at intervals that are adjustable from 5 minutes to 10 hours.
4. 32 perpetual holidays assigned to any one of three holiday day schedules and continuing for 1 to 120 days. Holiday dates shall be specific day/month/year, or

perpetual dates including day/month/all years or day of the week in a given month every year or self-calculating Easter Sunday.

5. Astronomic capability for calculating sunrise and sunset based on time, latitude, longitude, and time zones. All scheduled astronomic/time operations shall be interlocked so loads are not turned on when astronomic off times are earlier than scheduled on times or astronomic on times are later than scheduled off times. Each schedule shall have an independent astronomic offset of + 120 minutes.
6. Following a power outage, the system clock shall run a start-up process that executes schedules that would have been missed during the power outage.

C. Description:

1. The exterior photocell shall offer a footcandle range of 1-15 and an eight-second time delay. The photocell shall mount on the exterior or roof of a building with its light level window facing the northern sky. The photocell shall provide an ON signal when the ambient light level drops below a user-defined dark setpoint, and an OFF signal when the ambient light level rises above a user-defined light setpoint.

D. Features:

1. The photocell shall use a set of normally open, isolated relay contacts that are rated for one Amp at 30 VAC/VDC.
2. The photocell shall have an adjustable ON/OFF dark setpoint.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mounting heights indicated are to bottom of unit for suspended devices and to center of unit for wall-mounting devices.

3.2 CONTROL WIRING INSTALLATION

- A. Install wiring between sensing and control devices according to manufacturer's written instructions and as specified in Division 26 Section "Basic Electrical Materials and Methods."
- B. Bundle, train, and support wiring in enclosures.

3.3 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "Basic Electrical Materials and Methods - Electrical Identification."

3.4 FIELD QUALITY CONTROL

- A. Inspect control components for defects and physical damage, testing laboratory labeling, and nameplate compliance with the Contract Documents.
- B. Electrical Tests: Use particular caution when testing devices containing solid-state components. Perform the following according to manufacturer's written instructions:
 1. Continuity tests of circuits.
 2. Operational Tests: Set and operate devices to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions. Record control settings, operations, and functional observations.

3. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices. Refer to Division 1 Section "01 77 00 – Contract Closeout and Final Cleaning: Demonstration and Training."

END OF SECTION

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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 multi-outlet 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 pre marking 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 NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. 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. 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. Multi-outlet 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-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.
- B. Straight-Blade and Locking Receptacles: Heavy-Duty grade.
- C. Straight-Blade Receptacles: Hospital grade.
- D. 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 5-15R.
- 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. Incandescent Lamp Dimmers: Modular, 120 V, 60 Hz with continuously adjustable rotary knob, toggle switch, or slider; single pole with soft tap or other quiet switch; EMI/RFI filter to eliminate interference; and 5-inch wire connecting leads.
 3. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.4 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. Steel with white baked enamel, suitable for field painting

- b. 0.035-inch- thick, satin-finished stainless steel (above counters and in restrooms)
- 3. Material for Unfinished Spaces: Galvanized steel.
- 4. Material for Wet Locations: Cast aluminum with spring-loaded 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 5-15R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: See telecommunication specifications for requirements.

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 5 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.
- 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 NFPA 70.

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.

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

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SECTION 26 51 00

INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide new direct/indirect lighting with average of 50 foot-candles horizontal and minimum of 5 foot-candles vertical.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with:
 - 1. CEC: California Electrical Code.
 - 2. UL:
 - a. UL 875 - Light Emitting Diode (LED) Lighting Sources for Use in Lighting Products.
 - b. UL 1598 - Luminaires.
 - c. UL 1012 - Power Units Other Than Class 2.
 - d. UL 1310 - Class 2 Power Units.
 - e. UL 210 - Low Voltage Lighting Systems.
 - 3. ANSI:
 - a. C78.377.2008 Specifications for the Chromaticity of Solid State Lighting Products
 - 4. IESNA:
 - a. LM 79-80 - Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.
 - b. LM 80-08 - Approved Method for lumen Maintenance Testing of LED Light Sources.
 - c. TM 20-11 - Projecting Long Term Lumen Maintenance of LED Light Sources.
- C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.3 SUBMITTALS

- A. Manufacturer's Product Data:
 - 1. List of Materials: For each item, Include:
 - a. Manufacturer.
 - b. Model number.
 - c. Listing: UL, City Lab or none.
 - d. Quantity.
 - 2. Manufacturer's Product Data: In sequence of List of Materials, Data sheet for each item, including all accessories, marked for proposed product.

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 Fixtures: For use with plenum ceiling for air return and heat extraction and for attaching an air-diffuser-boot assembly specified in Division 23 Section "Diffusers, Registers, and Grilles."
 - 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: Energy efficient volumetric type meeting Title 24 and District standards.

2.4 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 with 25 years warranty.
- 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.

2.5 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.

2.6 LED LIGHTING

- A. Correlated color temperature (CCT): 3500 °K.
- B. Color rendering index (CRI): 75 minimum.
- C. Off-state power consumption: The power draw of the luminaire (including PE or remote monitoring unit) shall not exceed 2.50 watts when in the off state.
- D. Operating environment: Luminaire shall be able to operate normally in temperatures from -20° C to 50° C.
- E. Cooling system: Shall consist of a heat sink with no fans, pumps, or liquids, and shall be resistant to debris buildup that does not degrade heat dissipation performance.
- F. Lumen depreciation: LED module(s)/array(s) shall deliver at least 70% of initial lumens, when installed for a minimum of 100,000 hours.
- G. Lighting Distribution: Per lighting fixture schedule and in accordance with IESNA Lighting Distributions.
- H. Maximum amperage at LED: Maximum amperage at LED shall not exceed driver current to meet lumen depreciation value described above but shall not exceed 700 mA per mm² of chip. Multi-current (dimming) driver output shall be within the limits described in this Section. Provision only for dimming function controllable via networked control system.
- I. The Driver and LED arrays shall be designed for multi-current input operation, with adjustable ratings at 350 mA, 525 mA and 700 mA.
- J. Transient protection: Per IEEE C.62.41-1991, Class A operation. The line transient shall consist of seven strikes of a 100k HZ ring wave, Min. 10kV level, for both common mode and differential mode.
- K. Operating temperature: Power supply shall operate between -20° C and 50° C.
- L. Frequency: Output operating frequency must be ≥ 120 Hz (to avoid visible flicker) and input operating frequency of 60 Hz.
- M. Interference: Power supplies shall meet FCC 47 CFR Part 15/18 (Consumer Emission Limits).
- N. Noise: Power supply shall have a Class A sound rating per ANSI Standard C63.4.
- O. Fixture Warranty: Manufacturer shall warranty to replace defective light fixtures or parts thereof for a period of 5 years.

2.7 FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 26 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 gage.
- 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.

2.8 LIGHTING CONTROL DEVICES

- A. Dimming Driver Controls: Sliding-handle type with on/off control; compatible with driver and 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 20 to 100 percent in response to change.
 - 1. Sensor Capacity: At least 40 electronic dimming driver.
 - 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.

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: Provide both grid and additional wire supports. Refer to DSA IR 25-2/1.11 for requirements.
 - 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 one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
- C. Suspended Fixture Support: As follows:
 - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
 4. 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.

END OF SECTION

01/11/19